

# Health and safety at the workplace

Limit values and prevention measures



**TRUST BLUE**

- EU occupational safety directives
  - Increased safety and improved health protection at work
-

# Health and safety at the workplace

Occupational safety directives require protection from noise and vibrations

When manufacturing tools for surface finishing and cutting materials, PFERD follows fundamental requirements in terms of health and safety of employees. As a premium manufacturer, our aim is to continue to develop tools and manufacturing procedures in a manner that is ergonomic and efficient for the user. Moreover, we consider it our duty to propagate information about new findings and methods of protecting the health and safety of the people working with PFERD tools.



Numerous laws, regulations and provisions regulate occupational safety, and health and safety in the workplace. Occupational safety covers all measures which help to protect the life and health of people at work, to preserve their labour capacity, and to make workflows as humane as possible. The prevention of occupational accidents, occupational diseases and labour-related health risks forms part of this effort.

The respective state is responsible for the legal structuring of occupational safety. However, the countries are dependent on the European Union (EU) when it comes to their legislation. The European Union harmonizes occupational safety regulations in its member states and has laid an extensive groundwork of regulations and activities for the protection of health at work. EU directives on occupational safety are binding on all member states and must be adopted as part of their respective national legal systems.

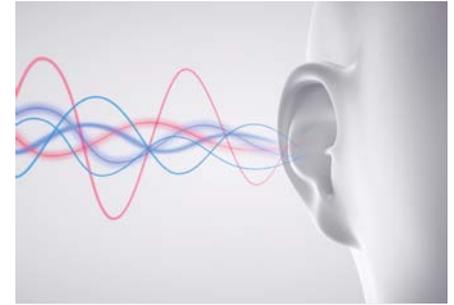
## European Union (EU) occupational safety directives

In the EU, minimum requirements have been defined for the protection of employees from noise (2002/44/EC) and vibration (2003/10/EC). In Germany, these were implemented in national legislation with the "Lärm- und Vibrations-Arbeitsschutzverordnung" (Noise and Vibration Occupational Safety Regulation) of 6 March 2007, which was last amended by Article 5 Para. 5 of the Regulation from 18 October 2017.



Noise is undesirable sound (for example machine noise, acoustic tones, explosion or impact noise, high-decibel music, irritating speech sound) that may give rise to hearing impairments or other damage to health.

Noise-induced hearing loss tops the statistics for occupational disorders. Intense noise at the workplace may affect the hearing of workers. In Germany, about 5 million employees are exposed to noise which presents a risk of hearing impairment.

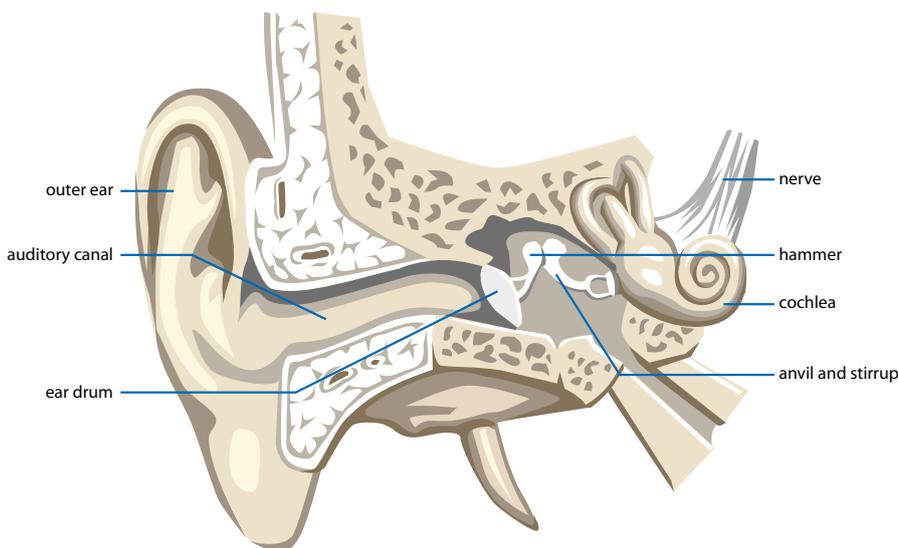


### How our ear works

Our ability to hear sound is based on a fascinating mechanism. Every sound consists of vibrations. These are transmitted through the air as waves and picked up and processed by our ear. We refer to this process as hearing.

The ear directs sound waves into the auditory canal through which they reach the eardrum, causing the latter to vibrate. These vibrations are transmitted to the fluid-filled cochlea, our actual hearing organ, via the auditory bones (hammer, anvil and stirrup).

Oscillations are thus produced in the fluid of the cochlea, like a stone flung into water will create waves. These oscillations pass to the inner ear which is lined with fine sensory cells (hair cells). The purpose of their minuscule hairs is to convert the mechanical oscillation into electrical impulses at the end of the transmission chain. An auditory nerve conducts these impulses to the brain, where they are processed into the actual acoustic image.



# Health and safety at the workplace

Regulations prescribe more effective noise protection at work

## Health effects of high noise exposure

Elevated noise levels, such as high-decibel music or loud traffic sounds, may depress the hairs on the hair cells. These hairs will then conduct sound less effectively, at least until they have reverted to their upright position. The noise of an explosion, or many years of continuous noise exposure at the workplace, may cause them to collapse or break off altogether. The result will be irreparable loss of hearing, since these hairs will not grow again.

Hearing is one of our brain's main sources of sensory input. Uncomfortable noise distracts us. As a result, we experience loss of concentration, fatigue, a reduced capacity to work due to increased physical strain, attention deficits, and an impaired ability to communicate verbally.

Hardness of hearing is incurable. Hearing aids can provide only a limited improvement. This makes noise protection all the more important.



## Regulations and exposure action values

In measuring sound levels, a filter is used to simulate the response of human hearing. This filter is referred to as the "A-filter". Sound intensity is commonly measured in decibels = dB(A).

In February 2003, the European Parliament and the European Council published EC Directive 2003/10/EC which defines the limits of noise exposure for workers. Like its predecessor, the new directive places primary emphasis on the duty to achieve technical noise abatement.

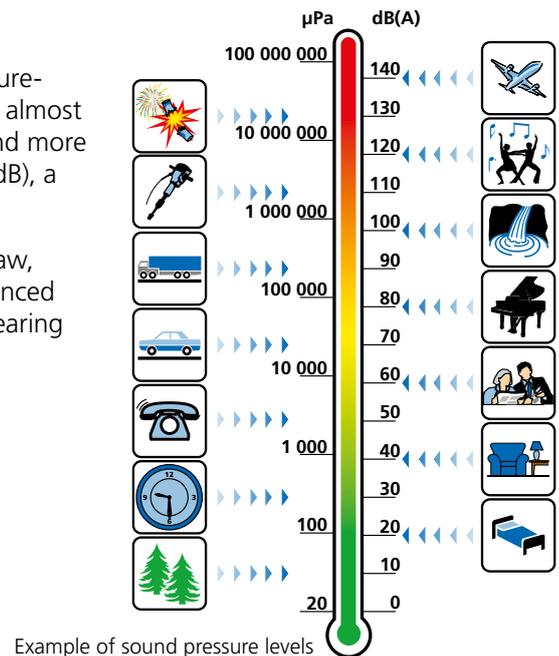
In the German implementation of this directive in the noise and vibration work protection directive, a distinction is made between two values for the daily exposure level: The lower trigger value of 80 dB(A) and the upper trigger value of 85 dB(A). When these values are reached or exceeded, certain measures become necessary; these measures can be found in the table on page 5.



### Sound pressure level (dB)

Sound pressure levels are measured in Pascal, the physical unit of measurement for pressure. The human ear can perceive acoustic stimuli over an almost inconceivably broad sound pressure range. In order to obtain smaller and more workable figures, the intensity of sound input is expressed in decibels (dB), a logarithmic unit.

The sensitivity of the human ear follows an approximately logarithmic law, too. As a result, a 10 dB increase in sound pressure level will be experienced as twice as loud. An increase by 3 dB is enough to double the risk of hearing impairment.



### Prevention measures

An employer must provide hearing protectors when noise levels exceed the lower exposure action value. However, the use of such equipment becomes mandatory only when the upper exposure action value is reached or exceeded. Workers are required to wear hearing protectors in high-noise areas, which need to be expressly marked as such.

Machines represent a main source of noise at the workplace. It follows that the call for noise abatement "at source", i.e., on the machinery in question, is a key factor in the noise control concept.

As a premium manufacturer, in its own production, PFERD favours machines and working processes which produce as little noise as possible, and is constantly working on the development of tools with reduced noise levels. With its patented multi-layer design, the SGP WHISPER STEELOX grinding wheel, for example, generates considerably less vibration and noise than conventional grinding wheels. The noise exposure is decreased by up to 12 dB(A), which corresponds to a reduction of more than 90 %.



All tools and more information: [www.pferd.com](http://www.pferd.com)

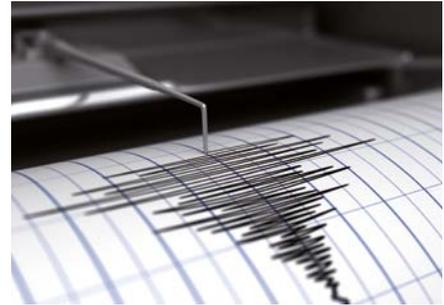
Upper/lower action value (L <sub>EX, 8h</sub> )	> 80 dB(A)	> 85 dB(A)
Duty to provide information and instruction	X (≥ 80 dB(A))	
Hearing protectors to be made available	X	
Right to a preventive audiometric examination if an assessment or measurement suggests a health hazard	X	
Right to have hearing examined by a doctor		X
Duty to wear hearing protectors		X (≥ 85dB(A))
Noise abatement programme		X
Marking of high-noise areas		X
Delimitation or access restriction, if technically feasible and justified by the exposure risk		X where noisemay exceed ≥ 80 dB(A)
Keeping of health records if an assessment or measurement suggests a health hazard	(X)	(X)

Source: See "Lärm- und Vibrations-Arbeitsschutzverordnung" (Noise and Vibration Occupational Safety Regulation) from 06/03/2007.

# Health and safety at the workplace

## Vibration exposure can damage our health

Vibrations are mechanical oscillations which pose a hazard to human health when acting continuously on the hand-arm system (hand-arm vibrations) or on the entire body (whole-body vibrations). Vibrations may cause blood circulation problems, bone or joint disorders, neurological or muscular conditions, back pain, or damage to the spinal column.



### Effects of vibrations on the human body

Scientists are researching vibration effects in an effort to determine thresholds which, when properly observed, will safeguard health. Occupational performance impairment and discomfort due to vibrations, whether in isolation or combined with noise, are another subject of human experimental studies for which highly advanced laboratories are available.

The health risk posed by vibration loads depend on the point of introduction into the human body (for example feet, buttocks, hands), the vibration intensity, and the effect of repeated daily exposure over a period of several years.

#### The following distinction is made in this context:

- **Whole-body vibrations**  
Introduction of vibrations via the feet (when standing) or buttocks (when seated), e.g. by vehicles, excavating equipment, forklift trucks, tractors, etc.
- **Hand-arm vibrations**  
Introduction of vibrations via the hands, e.g. by hand-held or hand-guided vibrating tools, equipment, machines or workpieces or, possibly, by the controls of mobile or stationary machines.

### Health effects of high vibration levels

The effect of vibrations is a function of their frequency and intensity. Vibrations in the low-frequency spectrum lead to disorders of the muscular and skeletal system (damage to joints).

The high-frequency portion damages the peripheral blood vessels and nervous system (disturbed blood circulation in the fingers and hands, or even numbness and loss of grip). Even low vibration levels may cause discomfort and reduced productivity.



## Regulations and exposure action values

In July 2002, the European Parliament released EC Directive 2002/44/EC which addresses the minimum health and safety requirements regarding worker exposure to risks arising from physical agents (vibration). The directive stipulates both an exposure action value and an exposure limit value.

Under this directive, employers are required, inter alia, to determine the level of exposure to vibrations at the workplace. A workplace is deemed to pose a hazard if it involves persistent vibration exposure in the form of hand-arm vibrations or whole-body vibrations.

The duration and intensity of the vibration exposure must initially be determined. A so-called daily exposure value, standardized to an 8-hour reference period, must then be established.

The new directives need to be observed wherever work is carried out with the aid of vibrating tools or equipment. Employers are expected to know and monitor the vibration exposure of their personnel, and to take remedial action where necessary.



## Exposure action values and limits

Exposure limit values and action values for vibration	Hand-arm vibrations (HAV) Daily vibration exposure value A(8)	Whole-body vibrations (WBV) Daily vibration exposure value A(8)
Exposure action value	A(8) = 2.5 m/s <sup>2</sup>	A(8) = 0.5 m/s <sup>2</sup>
Exposure limit value	A(8) = 5.0 m/s <sup>2</sup>	A(8) = 0.8 m/s <sup>2</sup> in Z-direction (vertically)  A(8) = 1.15 m/s <sup>2</sup> in XY-direction (horizontally)

Source: See "Lärm- und Vibrations-Arbeitsschutzverordnung" (Noise and Vibration Occupational Safety Regulation) from 06/03/2007.



# Health and safety at the workplace

## Prevention measures against vibration

### Prevention measures

If the exposure action value of 2.5 m/s<sup>2</sup> is exceeded for hand-arm vibrations, the employer is required to describe, in an action plan, by which means and in which period of time such worker exposure is to be reduced. When the exposure limit value of 5.0 m/s<sup>2</sup> is reached for hand-arm vibrations, the worker in question must no longer be assigned to any activities involving vibration exposure. The same applies to whole-body vibrations (see table on page 7).

#### When the trigger value is reached:

- Prepare and carry out vibration reduction program with technical and organizational measures (§10 LärmVibrationsArbSchV).
- Instruct employees about possible health hazards and health check-ups (§11 LärmVibrationsArbSchV).
- Offer employees medical check-ups (§5 ArbMedVV).

#### When the exposure limit value is reached:

- Determine reasons without delay and initiate further measures to reduce the exposure to a level below the exposure limit values (§10 LärmVibrationsArbSchV).
- Arrange for regular medical check-ups for employees (e.g. according to G46) (§5 ArbMedVV).

Quality is directly connected with benefit and customer satisfaction. That's why PFERD researches and develops innovative, high-performance products to reduce the influence of vibration, for example, the SENSOHANDLE anti-vibration handle and straight grinders with elastically mounted spindles.

*The statements in this brochure are based on the "Directive for the protection of employees from noise and vibration" in the version dated 2017-10-18. The accident prevention and insurance associations responsible will provide you with more detailed information.*



More information on straight grinders with elastically mounted spindles and the SENSOHANDLE can be found in the Tool Manual, catalogue section 9.



Dust is the distribution of solid substances in their coarse, fine or finest form in the air. This disperse distribution can be caused by mechanical and chemical processes, as well as due to the swirling up, for example, of spilled material. The air quality in work areas is adversely affected by dust. Not only does the pollutant content constitute a health hazard, but the size of the particles may also create issues. The smaller they are, the greater the health hazard.



## Regulations and action values

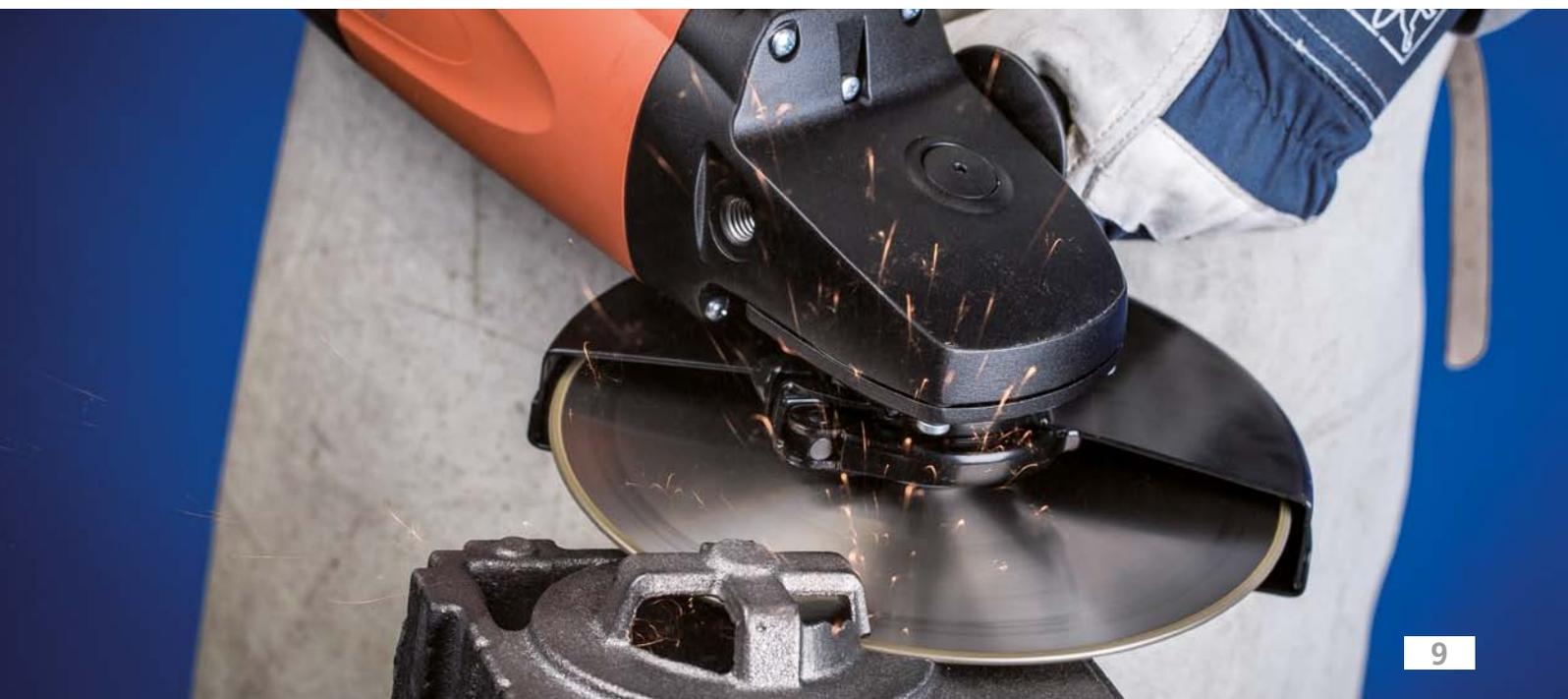
The quality of the air within working rooms must more or less correspond to outside air. From a health point of view, the size of the dust particles is decisive in addition to the pollutant contents of the dust. We differentiate between alveolar dust (A dust) and inhalable dust (E dust) for each of which different limit values apply.

Dust:	Limit value according to TRGS 900:
Alveolar (A) dust	1.25 mg/m <sup>3</sup>
Inhalable (E) dust	10 mg/m <sup>3</sup>

As, at the workplaces, there may be considerable fluctuations in the concentration of substances in the air being breathed in, the workplace threshold limit values are supplemented by short-term values. These limit the value of the maximum exceedance and restrict the fluctuations in their duration and frequency. An overarching specification of the short-term value parameters is not possible due to the very different effects of individual substances. As a general rule, as a maximum, if the work limit value is exceeded eightfold four times per shift, no further exposure is allowed for 15 minutes.

### The following distinction is made in this context:

- **Inhalable dust**  
 A particle which has a diameter of > 10 µm (1/1000 millimetre), so-called coarse dust, gets caught on nasal hairs or mucous membranes.
- **Alveolar dust**  
 Small dust particles can penetrate deep into the lung via the windpipe and bronchiae. For this reason, fine dust is also termed inhalable or respirable dust.



# Health and safety at the workplace

## Prevention measures against dust

### Prevention measures

In order to protect the employees against the danger of dust, it is necessary to comply with the workplace threshold limit values. For this reason, systems, machines and devices should be selected and operated so that as little dust as possible is released. Should dust still be released, however, the company should observe the following points:

- Capture dust at the point of exit or creation, and if possible dispose of completely.
- Equip machines etc. which cause dust with effective extraction systems. Here, guide the extracted air in such a manner that as little dust as possible reaches the air breathed in by employees.
- Remove unavoidable dust deposits using wet/damp/extraction processes.

### Measures for jobs with exposure to dust:

- Prevent spreading of the dust to uncontaminated work areas.
- Take organisational measures to shorten the length of exposure.
- Provide suitable personal protective equipment, particularly for respiratory protection. During peaks of exposure, the respiratory protection must be worn by the employee.

PFERD provides innovative tool solutions which include the **ALUMASTER** High Speed Disc for the processing of aluminium as it does not generate any hazardous or explosive dust. The diamond tools for foundries are also characterized by less dust thanks to the dimensional stability of the grinding tool (no tool wear).

*Basis for the statements made about dust pollution: Hazardous substances directive (GefStoffV), technical regulations for hazardous substances (TRGS), particularly TRGS 900.*



All tools  
and more information:  
[www.pferd.com](http://www.pferd.com)

## Physical strain can damage our health

Work that requires increased effort or that is performed in unfavourable positions, especially over a long period of time, can cause health problems and is a risk for the musculoskeletal system. It can lead to acute harm with progressive long-term damage, such as degenerative joint diseases, tenosynovitis, damage to the peripheral nerves and muscle hardening.



### Prevention measures

According to section 5 of the German occupational safety legislation (ArbSchG), the employer is obliged to assess working conditions in terms of their potential adverse health effects. For this assessment, the duration, frequency, body posture, force and operating conditions need to be considered in combination.

One way in which to counteract these harmful influences is through the use of small, lightweight, handy and easy-to-guide tools and tool drives. When using tools, it is important that the work is carried out with the lowest levels of force and effort, with a high amount of control, and with as much comfort as possible.

*Based on: German Occupational Safety Law (ArbSchG).*



## Technical customer support

The many years of experience of our technical advisers, and our direct contact with users on site help ensure we implement everything possible in the development and production of PFERD tools to improve work ergonomics.

Our sales representatives and technical advisers will be happy to help or even visit you. PFERD works alongside you to provide application engineering solutions for working with diverse materials.



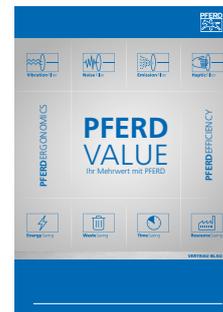
## PFERDVALUE – Your added value with PFERD

Results from the PFERD test laboratories as well as from the product tests by independent testing institutes prove: PFERD tools offer measurable added value.

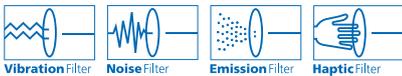
Discover **PFERDERGONOMICS** and **PFERDEFFICIENCY**:

As part of **PFERDERGONOMICS**, PFERD offers ergonomically optimized tools and tool drives that contribute to greater safety and working comfort, and thus to health protection.

As part of **PFERDEFFICIENCY**, PFERD offers innovative, high-performance tool solutions and tool drives with outstanding added value.



For more information on this topic, please refer to our brochure “**PFERDVALUE – Your added value with PFERD**”.



### The most important tool from PFERD: The Tool Manual

With more than 8,500 innovative solutions for work on surfaces and material cutting.

Request your own free copy at [www.pferd.com](http://www.pferd.com)

