

A close-up photograph of a worker's hand in a red and black safety glove operating a power tool, likely a grinder, which is producing a shower of bright orange sparks. The background is blurred, showing more of the worker's clothing and the industrial setting.

5 Steps to Controlling Hand Arm Vibration

According to the HSE, over 2 million workers in the UK are exposed to levels of hand arm vibration which put them at clear risk of developing one or more of the problems associated with Hand Arm Vibration Syndrome.

What are the affects of vibration

Hand Arm Vibration Syndrome (HAVS) refers to a condition typically brought on in the workplace from vibration from the use of hand-held power tools and other powerful vibrating machinery. It is a permanent painful condition affecting blood vessels, nerves and joints which over time can stop people from carrying out normal everyday tasks and cause disability, or in extreme cases the need for amputation. The condition can affect the body parts that make up your hand, wrist and arm and may develop slowly over time, becoming more severe the longer exposure occurs for.

Other related conditions caused by vibration and often covered generically under the HAVS term include Carpal Tunnel Syndrome (CTS) and Vibration White Finger (VWF); claims for these make up the second largest industrial injuries disablement benefit after lung-related diseases.

Whilst new claims have generally been declining – due to greater awareness of the issues and new ways of doing things – there are still around 1000 reported cases every year.

About this Guide

Unless vibration is identified and properly assessed, employers can't know the level of vibration risk and whether action is needed to protect workers. It is very important that people exposed to hand arm vibration are informed of the early symptoms such as tingling, numbness and whitening of fingers so that they are given opportunities to be protected from further permanent damage.

This Guide provides some basic guidance for companies who are making efforts to control the risks of hand arm vibration affecting their employees and comply with The Control of Vibration at Work Regulations (2005).

What are your duties as an employer?

Step 1: Establish whether there is a risk?

Firstly, you need to establish whether there are any vibration hazards in your workplace. This can be achieved by looking at the work being undertaken, how it is done i.e. what tools are needed to do the work and how often / to what extent they are used. This can be achieved through a combination of simple observation and a knowledge of employee work practices.

Tools that can cause **Hand Arm Vibration Syndrome (HAVS)** include:

- concrete breakers, concrete pokers
- sanders, grinders, disc cutters
- hammer drills
- chipping hammers
- chainsaws, brush cutters, hedge trimmers
- powered mowers
- scabblers or needle guns.



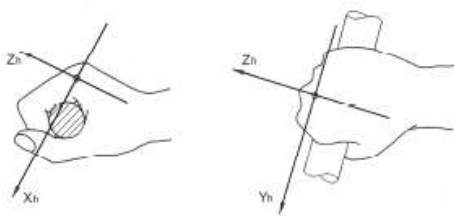
Step 2: If so, find out who is at risk?

Having found out what work practices present a hazard, you need to identify all employees who could be at risk. Evaluate how harm may occur, for instance, damage to circulation in the fingers, hands and/or arms. You should take into consideration those employees who may already have some form of damage to their hands or who are more vulnerable to HAVS because of pre-existing circulatory problems, such as those people with Diabetes or Reynauds disease.

Step 3: Measure

Talk with employees and find out what their typical work routine consists of, what types of power tools they use, how regularly they use them and how long they use them for - '**trigger time**'.

Under the Regulation, employers are asked to assess machinery and tools which then pose a risk. Whilst many manufacturers provide vibration data for their tools it is often of limited value because this is how they are tested when new in ideal user conditions; it does not take into account the condition of the tools, the nature of the work, and the way people do a job. Instead, you should carry out vibration magnitude measurements of the tools in real time in the real environment they are used in:



The daily exposure values must be determined using the vector sum (root-sum-square) of three axes of vibration. A hand-arm vibration meter, like the Pulsar vB, will use a tri-axial accelerometer, attached to the power tool, to do this automatically (calculating the sum of vibration across the three axis, X, Y and Z). This is also known as the vibration magnitude measured in m/s^2

What measurement information do you need?

To assess the vibration risk of individual tools you need the following:

1. Assess the vibration magnitude (Vector Sum) of the tools using a HAV meter. Measure as close to where the hand hold the tool as possible (with 2-handled tools measure each handle)
2. Assesses the tools Vibration Points Value (using the HSE Calculator)
3. Assess how long they can use the tool for without increased risk of damage.

To assess the vibration risk to individuals (daily exposure) you need the above (1-3) **and** the following:

4. Take note of actual or accurate estimates of how long they are used for (trigger time).
5. Any pre-existing health or circulatory conditions
6. Calculation partial Vibration exposure and/or partial vibration points exposure (HSE Calculator).

Step 4: Measuring daily exposure (vibration exposure)

Calculating daily exposure to vibration is required when employees use power tools for some, but not all, of their shift. Their overall vibration exposure is measured over a reference period 8 hours and is known as the A(8).

To calculate the A(8) for an individual, the Vector Sum m/s^2 is multiplied by the square root of the trigger time divided by the reference 8 hours. For example, if an employee uses a Strimmer for 1 hour with a Vector Sum of $5.5 m/s^2$ their A(8) is as follows:

$$A(8) = 5.5 \times \sqrt{(1 \text{ hour} / 8 \text{ hours})} = 1.9 \text{ m/s}^2 \text{ [under the Employee Action Value of } 2.5 \text{ m/s}^2]$$

The software provided with most HAV meters will do this calculation for you, or you can input the data into the HSE's HAV calculator. This A(8) assumes that the individual does not get exposed to any further vibration on their shift. You can also use a Hand-Arm Vibration 'ready reckoner' for calculating daily vibration exposures like the one on our website; all you need is the vibration magnitude (level) provided by a vibration meter like the Pulsar vB and the exposure time.

Calculating daily exposure for a combination of tools

If an individual uses more than one tool throughout their shift (i.e. a combination of vibrating tools). The overall exposure is calculated for an 8 hour day - A(8). The A(8) is needed for each of the tools the employee has used - each of one of these A(8)'s is the **partial vibration exposure** for the individual. These are then combined to give the overall exposure for that person on a typical shift using that combination of tools. Again, the software provided with most HAV meters or the HSE's calculator will do this for you.



Step 5: Reporting and making recommendations

Using the data collected in Step 3 and 4 and the knowledge of work practices and people at risk from Steps 1 and 2 you can now put together a picture of how long an individual can use a tool or tools for. There are essentially two ways to do this:

1. Via the vibration points system
2. Looking at Exposure Action Values (EAV) and Exposure Limit Values (ELV) over an 8-hour working day

The points system can be useful when people are involved in multiple tasks during a working day with risks of exposure. Tagging tools with their vibration points can be a much better way than simply colour coding them. The points system can be useful when people are involved in multiple tasks during a working day with risks of exposure. Tagging tools with their vibration points can be a much better way than simply colour coding them.

Exposure Action values and Limit values

Regulation 4 - of the Vibration Regulations sets out the Exposure limit values and action values for Hand Arm Vibration. The regulations define an **Exposure Action Value (EAV) of $2.5 m/s^2$** , and an **Exposure Limit Value (ELV) of $5.0 m/s^2$** . The EAV defines the exposure level at which point an employer must take action to reduce the exposure to as low a level as is reasonably practicable. If an employee is above the ELV an employer must reduce the exposure to below the limit value i.e. the Limit Value must not be exceeded (Regulation 6).

Values	Description	A(8) – m/s^2	Exposure Points
Exposure Action Value (EAV)	The daily exposure action value standardized to an eight-hour reference period.	2.5	100
Exposure Limit Value (ELV)	The daily exposure limit value standardized to an eight-hour reference period.	5.0	400

“The EAV is not stated to be a ‘safe’ level. Employers should concentrate on the elimination or reduction of vibration exposure and risk”

Recommendations for minimising exposure risk

The Vibration Regulations set out suggested ways to minimise exposure risk:

Regulation 5 - Select low vibration level tools and reduce exposure 'trigger' times where needed.

Regulation 6 - Maintain tools / machines

Regulation 7 - Health surveillance should be implemented where the EAV is exceeded

Regulation 8 - Provide information and instruction on the use of tools and how to detect signs of HAVs injury

Regulation 9 - Provide training on the correct use of tools.

In addition, the following measures can help:

- create a tool register which keeps records of every power tool, how they are used, their vibration magnitude m/s^2 , how long they can be used for, their exposure points, age, maintenance schedule and so on
- have a 'buy smooth' purchasing policy for low-vibration tools
- keep employees warm and encourage them to give up smoking to help blood circulation in hands and arms
- label tools using a colour-coded traffic light system (see below) for their vibration exposure levels, and/or use label them with points values (this is especially useful if more than one tool is used in a typical shift).

Traffic light colour	Vector sum acceleration level (m/s^2)	Recommended exposure times
	0 – 2.5	Up to 8 hours
	2.5 – 5.0	Up to 1 hour 30 mins
	>5.0	<30 minutes (consult H&S first)

Summary

The Regulations clearly state that "risks arising from exposure to mechanical vibration shall be eliminated at their source or reduced to a minimum". The EAV is not stated to be a 'safe' level and staying below it is not a sufficient defence if there are reasonably practicable steps you can take to eliminate or reduce vibration. Employers should concentrate on the elimination or reduction of vibration exposure and risk.

Under the "assessment of the risk to health and safety created by vibration in the workplace" defined by the Regulation, employers are required to record:

- significant findings, and
- the measures they have taken to meet the requirements. For example, we recommend that employers should show that a hierarchy of controls has been put in place for any exposure of employees above $1 m/s^2 A(8)$.

In summary, if you have collected information that shows you should have known there was a problem, you must be able to show you are doing something to control the risk.

Further information

We sell and hire out vibration meters, and our staff are also competent in site-based vibration assessments. Contact us to find out more.

Email: sales@pulsarinstruments.com

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