

## INFORMATION SHEET – PN3-01/November 2013

### Vibration Using declared values to estimate workplace exposures (Information for the employer)

#### 1. Regular use of power tools may cause hand-arm vibration syndrome if it is not adequately managed.

In Europe, the Vibration Directive (2002/44/EC) obliges employers to assess the risks to their workers arising from hand arm vibration associated with the use of power tools. The Vibration Directive introduces:

- a daily Exposure Action Value of  $2.5 \text{ m/s}^2$
- a daily Exposure Limit Value of  $5 \text{ m/s}^2$

Both the action and limit values are vibration values in the workplace, averaged over an 8-hour day.

#### 2. Workplace values and manufacturers' declared values

Vibration values measured in the workplace are not the same as those declared by manufacturers. Declared values are measured under repeatable conditions so that they can be compared and checked. The declared values for most pneumatic tools are measured according to the ISO 28927-series (previously the ISO 8662 / EN 28662-series). Electric tools are measured according to the EN 60745-series (previously the EN 50144-series) or ISO 28927-series. Tools which do not have a specific vibration test code are measured according to ISO 20643.

Workplace values depend not only upon the vibration produced by the tool, but also upon the type, condition and quality of the inserted tool, the state of maintenance of the power tool, the design of the work piece, the worker's posture, technique and physique.

The EU Vibration Directive requires workers' exposure to be assessed according to ISO 5349-1: 2001 and, if necessary, measured according to ISO 5349-2: 2001. Such measurements are performed in the workplace, are costly and time-consuming and have a measurement uncertainty of 20% to 40% (ref. ISO 5349-2: 2001, Clause 8).

#### **ROUGH ESTIMATE**

**Instead of initially concentrating your resources on finding the best estimate of the vibration exposure, consider instead obtaining a rough estimate and using that estimate to assess roughly whether the operator's exposure is likely to exceed the Daily Exposure Limit Value or Daily Exposure Action Value. If it is, you may find it is better to use your resources to reduce the exposure.**

## INFORMATION SHEET – PN3-01/November 2013

### 3. How to make rough estimates of vibration exposure

#### 3.1 Estimating the in-use vibration emission

The Vibration Directive exposure action and limit values relate to vibration total values (i.e. three-axes values).

If the declared value has been measured using the ISO 28927-series, the EN 60745:2006 (or later)-series standards or ISO 20643, it will be a vibration total value (i.e. a three-axes value). Providing that the expected use is based on a standard application which is envisaged by those standards, the declared values should be representative of those which are likely to be experienced in the work place. Therefore, these declared values do not need to have a correction factor applied and can be entered directly into the vibration calculator, together with the estimated daily exposure time (see 3.2).

If the declared value has been measured using the ISO 8662-series, EN 50144-series or EN 60745:2003-series standards, it will be a single-axis value. Nevertheless, in many cases, these **single-axis values can be multiplied by a correction factor** to estimate roughly the in-use vibration value which, together with the estimated trigger time, can be used for making rough estimates of daily vibration exposures; information about how to do this is given in CEN/TR 15350: 2013, “Mechanical vibration – Guideline for the assessment of exposure to hand-transmitted vibration using available information including that provided by manufacturers of machinery.”

**Table 1: Correction factors for different tool types and work tasks**

#### How to use Table 1:

1. Find the tool type in column 1.
2. Check that the vibration test code in column 2 is the same as that quoted in the manufacturer’s declaration. If it is, proceed to step 3.
3. Look at the real work task considered in column 3.
4. If the declared value is  $2.5\text{m/s}^2$  or higher, multiply it by the correction factor in column 4 for the real work task under consideration.
5. If the declared value is less than  $2.5\text{m/s}^2$ , raise it to  $2.5\text{m/s}^2$  and then apply the appropriate correction factor in column 4.

1	2	3	4
Tool type <sup>NOTE 1</sup>	Vibration test code	Real work task(s) considered	Correction factor
Riveting hammer Chipping hammer	ISO 8662-2	Riveting, Cutting	1.5
		Fettling, scaling, other applications	2
Rotary hammer Rock drill	ISO 8662-3	Hammer drilling Chiselling	2
Grinder (pneumatic)	ISO 8662-4	Grinding, cutting	1.5
Grinder (electric)	EN 50144-2-3	Grinding, cutting	1.5
		Polishing	Value in use likely to be lower
Pavement breaker Construction hammer	ISO 8662-5	Breaking concrete <sup>NOTE 2</sup>	2
		Breaking asphalt <sup>NOTE 2</sup>	1.5
Impact drill	ISO 8662-6	Impact drilling	1.5
Impact wrench Impulse tool Ratcheting screwdriver	ISO 8662-7	Tightening bolts	1.5

## INFORMATION SHEET – PN3-01/November 2013

1	2	3	4
Tool type <sup>NOTE 1</sup>	Vibration test code	Real work task(s) considered	Correction factor
Polisher Rotary sander Orbital sander Random orbital sander	ISO 8662-8	Polishing Rotary sanding Orbital sanding Random orbital sanding	1.5
Rammer	ISO 8662-9	Ramming	1.5
Nibbler Shears	ISO 8662-10	Cutting sheet metal	1.5
Fastener driving tool	ISO 8662-11	Driving fasteners every 3 seconds	Emission value likely to represent real use
Saw File	ISO 8662-12	Machining wood or steel	1.5
Straight die grinder Angle die grinder	ISO 8662-13	Using burrs or mounted points	1.5
Needle scaler Stone working tool	ISO 8662-14	Cleaning weld	2
Oscillating knives <sup>NOTE 3</sup>	ISO 28927-8: 2009	Cutting thick rubber	2
		Cutting thin rubber	1.5

NOTE 1 All tools are pneumatic unless otherwise stated.

NOTE 2 Some machines with vibration-damping handles are very sensitive for push force. For such machines, the quoted correction factors are only valid when the push force used is in accordance with manufacturer's recommendations.

NOTE 3 Oscillating knives used for cutting rubber are not covered by ISO 28927-8: 2009; however, CEN/TR 15350 suggests that the vibration emission can be estimated using the above correction factors.



***Increased risks from vibration exposure are likely to result from failing to follow the manufacturer's instructions on the correct way of using the tool and applying the feed force, or from not maintaining the tool and its accessories so that they work efficiently. Worn power tools and accessories should be serviced to maintain their original performance, or replaced.***

### 3.2 Estimating the daily exposure time

Once the in-use vibration values have been estimated, it will be necessary to **estimate the daily exposure time**. Note that the exposure duration is not the overall time spent on a specific job. The exposure duration is only the **trigger time** during which the hands are actually exposed to vibration. When asked, operators tend to overestimate the exposure duration; therefore it is better to estimate the exposure duration by observation of a sample of typical work.

Finally, the estimated vibration values ("vibration magnitude") and the estimated daily exposure time ("exposure duration") can be entered into the vibration calculator at <http://www.hse.gov.uk/vibration/hav/vibrationcalc.htm>. This will provide rough estimates of the daily exposure and of how long it will take to reach the exposure action and limit values. It is also possible to estimate the combined exposure from using several different types of tools each day.

## INFORMATION SHEET – PN3-01/November 2013

### 4. How to use estimated exposure values

Despite the apparent precision of the values produced by the vibration calculator, it is important to remember that, for reasons already explained, they are merely rough estimates. If the calculator indicates a certain number of hours' use to reach the exposure action value, it should not be understood that it is safe to operate a tool for that number of hours each day. The Vibration Directive requires the risks from vibration exposure to be "eliminated at source or reduced to a minimum."

Estimated exposure values can be useful for roughly:

- indicating whether the exposure action value or limit value is likely to be reached;
- ranking exposures from various processes, so that priority can be given to reducing those with higher values before moving on to those with lower ones;
- predicting and comparing likely exposures, when seeking alternative tools and processes.

An EU guide to managing hand-arm vibration can be found by accessing <http://www.pneurop.eu/index.php> and selecting 'Tools' then 'Legislation'. National regulations may differ slightly in their interpretation of the Vibration Directive: always refer to those of the country in which the work place is located.



***Using the tool for a sole specialist task, or in a way which is not represented by the quoted standard (e.g. ISO 28927 or EN 60745), or with accessories or consumables other than those which have been recommended or supplied by the manufacturer, may produce a different average emission and in such cases it is strongly recommended that a specific evaluation of the vibration emission is performed according to ISO 5349.***