



## A(8) and Exposure Time Calculations Explained

Many vibration exposure standards express action levels or limit levels in terms of criterion levels and criterion times. The criterion time is almost always 8 hours as this is the most typical workday duration. The criterion level is the corresponding vibration acceleration level that is allowable for the stated criterion time. Two examples of this are the action level of 2.5 m/s<sup>2</sup> for 8 hours and the limit level of 5.0 m/s<sup>2</sup> for 8 hours that are a part of the EU Directive addressing HAV exposures at work. These are more commonly expressed as an A(8) of 2.5 m/s<sup>2</sup> and an A(8) of 5.0 m/s<sup>2</sup>. Since actual vibration exposure times can often be less than a full 8 hours, it is necessary to be able to express a measured exposure level for a duration less than 8 hours as an 8-hour energy equivalent level. The formula below computes the 8-hour energy equivalent vibration acceleration exposure level when the actual exposure duration is less than 8 hours. The calculation assumes zero vibration exposure during the non-exposed balance of the 8 hours.

### Determining A(8) when vibration acceleration rate and exposure duration are known.

Use the formula:  $A(8) = a_{hv}\sqrt{T/8}$

Where:  $a_{hv}$  = measured vibration acceleration rate expressed in m/s<sup>2</sup>.  
T = actual exposure duration expressed in hours.

**Example:** Several measurements of a hand tool indicate the vibration acceleration rate averages 5.71 m/s<sup>2</sup>. The worker using the tool is exposed to this vibration level for a total of 3.3 hours per day.

$$\begin{aligned}A(8) &= 5.71\sqrt{3.3/8} \\A(8) &= 5.71\sqrt{0.4125} \\A(8) &= 5.71 \times 0.642262 \\A(8) &= 3.67 \text{ m/s}^2\end{aligned}$$

It can also be valuable to understand how many hours a tool can be used before reaching the action level or the limit level. The formula below provides this information.

### Determining allowable exposure time when vibration acceleration rate and 8-hour exposure criterion level are known.

Use the formula:  $T = [(A(8)/a_{hv})^2]8$

Where: A(8) = 8-hr energy equivalent criterion level expressed in m/s<sup>2</sup>.  
 $a_{hv}$  = measured vibration acceleration rate expressed in m/s<sup>2</sup>.

**Example:** The EU Directive expresses a A(8) criterion level of 5.0 m/s<sup>2</sup> as the daily limit. In the example above, we now want to know how long it will take to reach this EU limit level.

$$\begin{aligned}T &= [(A(8)/a_{hv})^2]8 \\T &= [(5.0/5.71)^2]8 \\T &= [0.875657^2]8 \\T &= [0.766775]8 \\T &= 6.1 \text{ hours}\end{aligned}$$

SPECIAL NOTE: The HAVPro System from Quest Technologies performs each of these calculations for you in an automated fashion. For more information visit [www.Quest-Technologies.com](http://www.Quest-Technologies.com) and click on "Vibration Monitors".