Hand-Arm Vibration Measurement System

A machinery safety directive was enacted by the EU in 2002, whose objective and main targets are shown below

**Purpose:** Obligate employers to reduce the risk of injury in persons using hand-held power tools.

**Main requirements:** Require employers to establish indicative values and limit values. If indicative values are exceeded, provide information to machinery operators about risk reduction, and carry out suitable health checks.

In order for employers to assess the vibration exposure of operators, data regarding the vibration levels of hand-held power tools as well as about usage time etc. are required. Manufacturers of hand-held power tools must provide vibration ratings and indications that allow employers to fulfill their obligations. A measurement setup for the evaluation of human exposure to hand-transmitted vibration is described in ISO 5349-1. Measurement methods are specified in ISO 8662-1 and ISO 5349-2. The current system complies with these standards. Because frequency analysis is carried out at the same time, the results are also useful for devising vibration countermeasures.

### Equipment configuration

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Channel Signal Analyzer</td>
<td>SA-02M (8ch)</td>
<td>1</td>
</tr>
<tr>
<td>Computer for SA-02</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Hand-arm Vibration Measurement Software</td>
<td>CAT-SA02-HT</td>
<td>1</td>
</tr>
<tr>
<td>Piezoelectric Accelerometer (Triaxial)</td>
<td>PV-971</td>
<td>2</td>
</tr>
<tr>
<td>BNC adapter</td>
<td>VP-52C</td>
<td>6</td>
</tr>
<tr>
<td>BNC link connector</td>
<td>VP-54C</td>
<td>6**1</td>
</tr>
<tr>
<td>BNC-BNC coaxial cable</td>
<td>EC-90 series</td>
<td>6**1</td>
</tr>
</tbody>
</table>

*1 The PV-97I is supplied with a 3-meter cable. These extension parts are required only if longer cable runs are necessary.
Measurement result examples

ISO 8041 Human response to vibration  Measuring instrumentation
ISO 5349-1 Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 1: General requirements
ISO 5349-2 Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 2: Practical guidance for measurement at the workplace
ISO 8662-1 Hand-held portable power tools - Measurement of vibrations at the handle - Part 1–Part14

Triaxial measurement

Hand-arm frequency correction coefficient Wh is used.

Evaluation quantity: Vibration total value \( \mathbf{a}_V \) (m/s²)

This value is determined by the vector sum of vibration values for each axis.

Measurement time: At least 1 minute is desirable.

Accelerometer attachment position: Specified separately in standards for respective product category.

Example of accelerometer attachment positions (chain saw)

Application examples

Hand-held power tools such as chain saws, bush cutters, sanders, grinders, rock drills, pavement breakers, etc.

Supplementary information: Measurement method features

1. Triaxial measurement
2. Hand-arm frequency correction coefficient Wh is used.
3. Evaluation quantity: Vibration total value \( \mathbf{a}_V \) (m/s²)

This value is determined by the vector sum of vibration values for each axis.

4. Measurement time: At least 1 minute is desirable.