

ISO/TC 108

Secretariat: ANSI

Voting begins on:  
**2021-02-26**

Voting terminates on:  
**2021-04-23**

## Human response to vibration — Measuring instrumentation —

### Part 2: Personal vibration exposure meters

*Réponse des individus aux vibrations — Appareillage de mesure —*

*Partie 2: Instruments de mesure de l'exposition des personnes aux vibrations*

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

ISO/FDIS 8041-2

<https://standards.iteh.ai/catalog/standards/sist/9f937e15-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2>

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

ISO/CEN PARALLEL PROCESSING



Reference number  
ISO/FDIS 8041-2:2021(E)

© ISO 2021

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO/FDIS 8041-2

<https://standards.iteh.ai/catalog/standards/sist/9f937e5-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b>	<b>vi</b>
<b>Introduction</b>	<b>vii</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>2</b>
<b>4 Reference environmental conditions</b>	<b>4</b>
<b>5 Performance specifications</b>	<b>4</b>
5.1 General characteristics	4
5.1.1 Common characteristics	4
5.1.2 Special characteristics for whole-body vibration measurement	6
5.1.3 Special characteristics for hand-arm vibration measurement	6
5.2 Display	6
5.3 Electrical output	7
5.4 Vibration sensitivity	7
5.5 Accuracy of indication at reference frequency under reference conditions	7
5.6 Frequency weightings and frequency responses	8
5.6.1 Parameters	8
5.6.2 Band-limiting filter	9
5.6.3 a-v transition filter	9
5.6.4 Upward-step filter	9
5.6.5 Overall frequency weighting	9
5.6.6 Tolerances	10
5.7 Amplitude linearity	11
5.8 Instrument noise	11
5.9 Signal-burst response	11
5.10 Overload indication	14
5.11 Under-range indication	15
5.12 Time averaging	15
5.13 Running RMS acceleration	15
5.14 Clearance of data and instrument state (named reset)	15
5.15 Timing facilities	15
5.16 Electrical cross-talk	15
5.17 Vibration transducer characteristics	15
5.18 Power supply	15
5.19 Operator detection system	16
5.20 Detection of transient acceleration artefacts	16
5.21 Logging capabilities	16
5.22 Contact force measurement	17
5.23 Warning indication	17
5.23.1 General	17
5.23.2 Mandatory warning indications	17
5.23.3 Optional warning indications	17
5.24 Human interface and ergonomic aspects	18
<b>6 Mounting</b>	<b>19</b>
<b>7 Environmental and electromagnetic criteria</b>	<b>19</b>
7.1 General	19
7.2 Air temperature	19
7.3 Surface temperature	19
7.4 Electrostatic discharge	19
7.5 Radio-frequency emissions and public-power-supply disturbances	20
7.6 Immunity to AC power-frequency fields and radio-frequency fields	20
7.7 Ingress of water and dust	21

<b>8</b>	<b>Provision for use with auxiliary devices</b>	<b>21</b>
<b>9</b>	<b>Instrument marking</b>	<b>21</b>
<b>10</b>	<b>Instrument documentation</b>	<b>21</b>
<b>11</b>	<b>Performance testing</b>	<b>22</b>
<b>12</b>	<b>Pattern evaluation</b>	<b>23</b>
12.1	General	23
12.2	Testing requirements	24
12.3	Submission for testing	24
12.4	Marking of the instrument and information in the instrument documentation	24
12.5	Mandatory facilities and general requirements	24
12.6	Initial instrument preparation	25
12.7	Indication at the reference frequency under reference conditions	25
12.8	Electrical cross-talk	26
12.9	Vibration transducer	26
12.10	Amplitude linearity	26
12.10.1	Electrical tests of amplitude linearity	26
12.10.2	Mechanical tests of amplitude linearity	27
12.11	Frequency weightings and frequency responses	28
12.11.1	General	28
12.11.2	Mechanical tests of frequency response	29
12.11.3	Electrical tests of frequency response	30
12.11.4	Conformance	31
12.12	Instrument noise	31
12.13	Signal-burst response	31
12.14	Overload indication	32
12.15	Reset	32
12.16	Combined axis outputs	32
12.17	AC electrical output	32
12.18	Timing facilities	32
12.19	Power supply	32
12.20	Environmental, electrostatic and radio-frequency tests	33
12.20.1	General	33
12.20.2	Expanded uncertainties for measurements of environmental conditions	33
12.20.3	Acclimatization requirements for tests of the influence of air temperature and relative humidity	33
12.20.4	Test of the influence of air temperature and relative humidity combined	33
12.20.5	Influence of surface temperature	34
12.20.6	Influence of electrostatic discharges	34
12.20.7	Radio-frequency emissions and public-power-supply disturbances	35
12.20.8	Immunity to AC power-frequency fields and radio-frequency fields	35
12.21	Operator detection system	36
12.22	Logging capabilities	36
12.23	Warning indication (mandatory warnings)	37
12.24	Test report	37
<b>13</b>	<b>Periodic verification</b>	<b>37</b>
13.1	General	37
13.2	Testing requirements	38
13.3	Test object	38
13.4	Submission for testing	38
13.5	Preliminary inspection	38
13.6	Marking of the instrument and information in the instrument documentation	38
13.7	Test procedure	39
13.8	Test parameters	39
13.8.1	Vibration measurement chain for hand-arm vibration	39
13.8.2	Vibration measurement chain for whole-body vibration	40
13.8.3	Vibration measurement chain low-frequency whole-body vibration	40

13.9	Conducting the test .....	40
13.10	Test report .....	41
<b>14</b>	<b>In-situ check .....</b>	<b>41</b>
14.1	General .....	41
14.2	Preliminary inspection .....	41
14.3	Vibration sensitivity (field calibration) .....	41
<b>Annex A (informative) Treatment of transient acceleration artefacts .....</b>		<b>43</b>
<b>Annex B (informative) Influence of coupling force on hand-arm vibration evaluation .....</b>		<b>48</b>
<b>Annex C (informative) Human interface .....</b>		<b>52</b>
<b>Bibliography .....</b>		<b>53</b>

## iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/FDIS 8041-2

<https://standards.iteh.ai/catalog/standards/sist/9f937e5-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 231, *Mechanical vibration and shock*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 8041 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

ISO 8041-1 specifies instruments for measuring human exposure to vibration. These instruments are used for temporary, short time measurements or controlled measurements.

This document specifies personal vibration exposure meters (abbreviated to PVEM) for measuring human exposure to vibration over long time periods, e.g. a whole working shift.

It is not necessary for PVEM to fulfil all of the specifications given in ISO 8041-1. On the other hand, it is necessary for them to fulfil other requirements which allow non-controlled measurements or stand-alone measurements over longer time periods. In combination with alarm functions, PVEM can make it possible to alert the user before vibration exposure reaches certain values (action value, limit value). For this reason, it is necessary to distinguish PVEM from the instrumentation specified in ISO 8041-1.

Whilst some potential applications and artefacts are covered in the informative annexes, this standard is an instrument standard and does not cover all potential applications of the PVEM. The reader should refer to measurement standards and guidance for further information.

[Annex A](#) describes the treatment of transient acceleration artefacts, [Annexes B](#) and [C](#) describe possible extension features with additional information for the measurement procedure.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/FDIS 8041-2](#)

<https://standards.iteh.ai/catalog/standards/sist/9f937e5-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2>

## **iTeh STANDARD PREVIEW** **(standards.iteh.ai)**

ISO/FDIS 8041-2

<https://standards.iteh.ai/catalog/standards/sist/9f937ef5-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2>



# Human response to vibration — Measuring instrumentation —

## Part 2: Personal vibration exposure meters

### 1 Scope

This document specifies minimum requirements for personal vibration exposure meters (PVEM).

This document is applicable to instruments designed for measurements of whole-body vibration in the context of industrial hygiene applications (according to ISO 2631-1, ISO 2631-2 and ISO 2631-4) and/or hand-arm vibration (according to ISO 5349-1) together with the associated exposure times.

This document provides specified design goals and permitted tolerances that define the minimum performance capabilities and functional requirements of instruments designed to measure personal daily vibration exposure.

This document does not apply to instruments designed to measure or log exposure times without also performing vibration measurement. Instrumentation of this type is described in ISO/TR 19664.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

ISO 2631-1, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*

ISO 2631-2, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 2: Vibration in buildings (1 Hz to 80 Hz)*

ISO 2631-4, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 4: Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew comfort in fixed-guideway transport systems*

ISO 5347 (all parts), *Methods for the calibration of vibration and shock pick-ups*

ISO 5349-1, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements*

ISO 5805, *Mechanical vibration and shock — Human exposure — Vocabulary*

ISO 8041-1:2017, *Human response to vibration — Measuring instrumentation — Part 1: General purpose vibration meters*

ISO 10326-1, *Mechanical vibration — Laboratory method for evaluating vehicle seat vibration — Part 1: Basic requirements*

ISO 15230-1:—<sup>1)</sup>, *Mechanical vibration and shock — Coupling forces at the man-machine interface for hand-transmitted vibration*

ISO 16063 (all parts), *Methods for the calibration of vibration and shock transducers*

ISO 16063-21, *Methods for the calibration of vibration and shock transducers — Part 21: Vibration calibration by comparison to a reference transducer*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity standard for industrial environments*

CISPR 22:2008, *Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement*

## iTeh STANDARD PREVIEW (standards.iteh.ai)

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041, ISO 2631-1, ISO 5349-1, ISO 5805, ISO 8041-1 and the following apply.

[ISO/FDIS 8041-2](https://standards.iteh.ai/catalog/standards/sist/09377e5-e044-4e57-b7a1-53679a1daa88/iso-fdis-8041-2)

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### **personal vibration exposure meter**

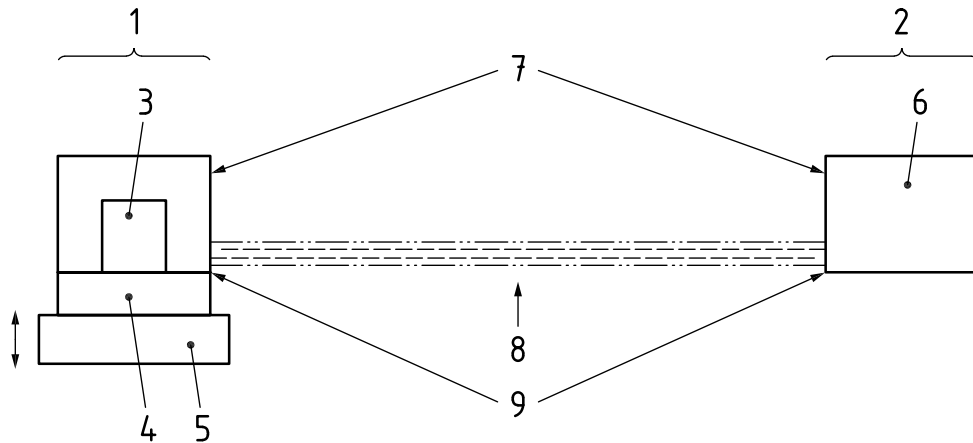
##### **PVEM**

instrument designed to measure and log personal vibration exposures by detecting occurrences of exposure and measuring associated human vibration together with the exposure time

Note 1 to entry: The principal components of a personal vibration exposure meter are shown in [Figure 1](#).

---

1) Under preparation. Stage at the time of publication: ISO/DIS 15230-1:2021.

**Key**

- |   |                   |   |  |
|---|-------------------|---|--|
| 1 | part A            | 6 | display and control                            |
| 2 | part B            | 7 | logging, signal processing                     |
| 3 | transducer        | 8 | fixed or temporary wired or wireless interface |
| 4 | coupling          | 9 | operator detection system (ODS)                |
| 5 | vibrating surface |   |  |

**Figure 1 — Principal components of a PVEM**

**STANDARD PREVIEW**  
 (standards.iteh.ai)

**3.2****permanent measurement system**

system which is permanently incorporated into or fitted onto a machine

Note 1 to entry: A permanent measurement system is not designed to be routinely transferred to other vibrating machinery.

**3.3****non-permanent measurement system**

system which is designed to be used on several machines or other vibrating objects

Note 1 to entry: A non-permanent measurement system is capable of routinely being transferred from one vibrating object or machine to another.

**3.4****user**

person authorized to operate a *PVEM* (3.1)

**3.5****operator**

worker

person who performs a work task at a workplace

**3.6****logging**

storing measured acceleration values at regular time intervals

**3.7****logging step**

time interval between the start of two consecutive *logging* (3.6) periods

### 3.8 measurement period

duration of all measurements, representing the *worker's* (3.5) exposure time

Note 1 to entry: The measurement period usually comprises many *logging steps* (3.7).

### 3.9 transient acceleration artefact

event or effect that can alter the computation of *workers'* (3.5) daily exposure to vibration

Note 1 to entry: For a *PVEM* (3.1), it is essential to log sufficient information to identify transient acceleration artefacts for the purpose to treat them in real time or in the post-processing.

## 4 Reference environmental conditions

Reference environmental conditions for specifying the performance of a personal vibration exposure meter are the following:

- air temperature: 23 °C;
- relative humidity: 50 %.

## 5 Performance specifications

### 5.1 General characteristics

#### 5.1.1 Common characteristics

A personal vibration exposure meter (PVEM) is a vibration measurement system meeting the relevant requirements of ISO 8041-1 with the additional capability to monitor personal exposures up to a full working day.

Since personal vibration exposure meters are instruments capable of measuring and computing daily vibration exposures they are simple to use and implement (internal complexity hidden from the user) and automatic (i.e. they do not require manual post-processing or computations), while displaying accurate and reliable results. Hence, as compared to general-purpose vibration meters, PVEM shall run algorithms that replace as much as possible any required manual signal post-processing.

Particularly, one design goal is to identify measurement events or periods that might need to be rejected and that could be automatically discarded from the vibration exposure computation using artefact rejection algorithms. Those automatic artefacts rejection algorithms are an additional feature of PVEM as compared to general-purpose vibration meters. In operation PVEMs are typically left unattended.

5.19 to 5.24 give additional recommendations and specifications for PVEM.

The PVEM may consist of separate parts (see parts A and B in Figure 1). Part B of the PVEM provides the means to present the results of measurements. The presentation of results may be in any suitable form, e.g. continuous “live” display or upload of measured values to a dedicated displaying unit or a computer at the end of the measurement period. Part B is an inherent part of the PVEM and compulsory for a pattern evaluation and periodic verification of the PVEM. However, it needs not to be used with part A for the period of exposure measurement.

In addition to the relevant requirements of ISO 8041-1, a PVEM shall

- derive vibration exposure by measuring vibration magnitudes and directly related exposure times,
- measure vibration in three directions (x, y, z) simultaneously,

- provide capability for measurement over the period of a working day (at least 12 h) without intervention by the user,
- include a real-time clock,
- continuously log vibration data versus time over the full measurement period at suitable programmable intervals which are no greater than 1 s,

NOTE Suitable logging steps can be as defined in ISO 2631-4 or selected by the user. The manufacturer can provide a choice of logging periods according to the measurement type.

- store logged vibration exposure data in a non-volatile memory, such that the data are not compromised if the power supply is interrupted (e.g. if the battery is low or being replaced),
- output information on logged vibration magnitudes, corresponding real time, and overall daily vibration exposure and daily exposure time, and
- provide information that will assist the user to exclude transient acceleration artefacts from exposure measurements (see [Annex A](#)).

The facility for reading measurement data from the instrument may be a direct display on the instrument or a remote display, or both.

Where the PVEM provides alarms for exposure exceedances, then the manufacturer shall provide information on the conditions for the alarm trigger points and on any capability to adjust the exposure trigger levels.

The reference vibration signal values and reference frequencies are given in [Table 1](#).

Not all of the frequency weightings given in [Table 1](#) need to be implemented in a PVEM, and further frequency weightings (see ISO/TR 18570) may also be implemented. The manufacturer shall state which frequency weightings are implemented.

**Table 1 — Reference vibration values and frequencies**

Application	Frequency weighting	Nominal frequency range	Reference		Weighting factor at reference frequency	Weighted acceleration at reference frequency and RMS acceleration value
			Frequency	RMS acceleration value		
		Hz		m/s <sup>2</sup>		m/s <sup>2</sup>
Hand-transmitted	$W_h$	8 to 1 000	500 rad/s (79,58 Hz)	10	0,202 0	2,020
Whole-body	$W_b$	0,5 to 80	100 rad/s (15,915 Hz)	1	0,812 6	0,812 6
	$W_c$				0,514 5	0,514 5
	$W_d$				0,126 1	0,126 1
	$W_e$				0,062 87	0,062 87
	$W_j$				1,019	1,019
	$W_k$				0,771 8	0,771 8
	$W_m$	1 to 80			0,336 2	0,336 2
Low-frequency whole-body	$W_f$	0,1 to 0,5	2,5 rad/s (0,397 9 Hz)	0,1	0,388 8	0,038 88

### 5.1.2 Special characteristics for whole-body vibration measurement

For instruments designed for whole-body vibration, the PVEM shall

- measure vibration at the interface between the machine and the operator's body (in accordance with ISO 2631-1),
- be capable of responding to vibration peak values up to 50 m/s<sup>2</sup>,

NOTE In special applications vibration peak values up to 200 m/s<sup>2</sup> have been observed.

- measure exposure characteristics based on A(8) exposures,
- optionally, measure exposure characteristics based on vibration dose value (VDV),
- optionally, measure exposure characteristics based on maximum transient vibration value (MTVV),
- optionally, measure exposure characteristics based on motion sickness dose value (MSDV),
- allow all part A components (see [Figure 1](#)) to be fitted unobtrusively to either the machine seat or the machine operator,
- (for non-permanent and optionally for permanent measurement systems) incorporate the part A component of the instrument into a seat pad meeting the requirements of ISO 10326-1, and
- (for permanent measurement systems not using a seat pad) incorporate the part A component of the PVEM into a seat structure in a way that does not adversely impact the seat suspension system or comfort of the driver but provides measurements equivalent to that required by ISO 2631-1 for health effects.

The directions of the three orthogonal axes shall be marked on the transducer.

### 5.1.3 Special characteristics for hand-arm vibration measurement

For instruments designed for hand-arm vibration, the PVEM shall

- measure vibration at the interface between the machine and the operator's hand (in accordance with ISO 5349-1). The directions of the three orthogonal axes shall be marked on the transducer.
- define the range of application of the PVEM based on the maximum peak vibration capability of the instrument. In any case, as a minimum, the transducer shall be capable of responding to peak accelerations up to 2 000 m/s<sup>2</sup>.

NOTE Higher peak acceleration capability is needed for measurements on impactive machines (e.g. up to 30 000 m/s<sup>2</sup>).

- allow all part A components (see [Figure 1](#)) to be fitted unobtrusively to either the machine operator or the vibrating machine (see ISO 5349-2).

The part A component of the instrument shall conform to the requirements of ISO 5349-1 and take account of the guidance given in ISO 5349-2. The part A component of the instrument may be incorporated into or fitted to a machine or power tool. If the part A component is incorporated into the device a operator identification system can be necessary.

If the PVEM is designed to provide evaluation of coupling forces, it shall conform to the applicable requirements of ISO 15230-1.

## 5.2 Display

Displaying of the vibration magnitude and other results measured by the PVEM should be provided by part B of the instrument at least for testing purpose (see [Figure 1](#)).



For type approval and periodic verification, the instrument shall display the frequency-weighted acceleration values.

The display device(s) specified in the instrument documentation shall permit displayed measurement values with a resolution of not more than 1 % of the indicated value.

Within the prevailing environmental conditions, the time interval required for stabilizing and being ready to use shall be documented.

For instruments that can display more than one measurement quantity, a means shall be provided to ascertain clearly the measurement quantity that is being displayed, preferably indicated by standard abbreviations or letter symbols.

The quantities that can be displayed by the PVEM shall be described in the instrument documentation, along with a description of the corresponding indications on each display device.

When results of a measurement are provided at a digital output, the instrument documentation shall describe the method for transferring or downloading the digital data to an external data storage or display device, e.g. a computer. The instrument documentation shall identify the software as well as the hardware for the interface. Internationally standardized interface bus compatibility is recommended.

For instruments with digital display devices updated at periodic intervals, the indication at each display update shall be the value of the user-selected quantity at the time of the display update. Other modes of indication at the time of the display update may be identified in the instrument documentation and, if so, the operation of such modes shall be explained in the instrument documentation. The instrument documentation shall state which modes conform to the specifications of this document and which do not conform.

ITEH STANDARD PREVIEW  
(standards.iteh.ai)

### 5.3 Electrical output

No AC electrical output for PVEM is required. [ISO/FDIS 8041-2  
https://standards.iteh.ai/catalog/standards/sist/9f937e5-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2](https://standards.iteh.ai/catalog/standards/sist/9f937e5-c044-4a57-b7ea-53679a1daa88/iso-fdis-8041-2)

### 5.4 Vibration sensitivity

The instrument documentation shall specify at least one model of field vibration calibrator as a means to check and maintain the mechanical sensitivity of the PVEM. The field vibration calibrator shall conform to the specifications given in ISO 8041-1:2017, Annex A. The manufacturer shall describe the attachments and jigs used with the vibration calibrator in the instruction manual.

The instrument documentation for the vibration instrument shall describe the procedure for adjusting the indicated vibration to conform to the specifications in this document by application of the specified field vibration calibrator. The adjustment shall apply to the models of vibration transducers recommended in the instrument documentation for use with the PVEM. The adjustment shall also apply to any cables, connectors and other accessories provided by the manufacturer of the instrument for connecting a vibration transducer to the instrument.

### 5.5 Accuracy of indication at reference frequency under reference conditions

The requirements for tolerance of the displayed results are given in [Table 2](#). The tolerance of indication is specified at the appropriate reference frequency and reference vibration value specified in [Table 1](#) with the instrument switched to the reference measurement range, with sinusoidal mechanical vibration applied to the base of the vibration transducer or specified mounting device. The requirements apply to all frequency weightings specified in this document and after applying adjustments described in [5.4](#) and after the specified stabilization time interval has elapsed.