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AMENDMENT 2
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Mechanical vibration and shock — Hand-arm vibration — Measurement and evaluation of the vibration transmissibility of gloves at the palm of the hand

AMENDMENT 2

Vibrations et chocs mécaniques — Vibrations main-bras — Mesurage et évaluation du facteur de transmission des vibrations par les gants à la paume de la main

AMENDEMENT 2

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This document was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock,* 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).

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Mechanical vibration and shock — Hand-arm vibration — Measurement and evaluation of the vibration transmissibility of gloves at the palm of the hand

AMENDMENT 2

9.3.3

Replace the title with the following:

"Lacks (gaps) in the vibration-reducing material"

9.3.3.1

Replace the text with the following:

"Antivibration gloves may be fabricated in which the vibration-reducing material placed in the thumb and finger sections of the gloves is not directly connected to the adjacent vibration-reducing material placed in the palm section. In some constructions of the gloves (for example in large nubs), the gaps can also lie in other areas. Likewise, these gaps should not be too large in relation to the material thickness. In cases where the vibration-reducing material placed in the thumb and finger sections of the gloves is not directly connected to the adjacent vibration-reducing material placed in the palm section, the following requirements shall be met."

9.3.3.3

Replace the text with the following:

"Lacks (gaps) between the thumb and finger sections and the palm vibration-reducing material

The lacks (gaps) in the vibration-reducing material such as those between the thumb and finger sections and the adjacent palm vibration-reducing material section shall not be greater than the thickness of the palm vibration-reducing material section along the length of the lacks.

The evaluation shall follow the procedure defined in Annex C."

9.3.3.4

Replace the text with the following:

"**Securing of the vibration-reducing material in the thumb and finger sections**

The vibration-reducing material in the thumb and finger sections shall be secured in the gloves so that the material does not slip or come out of position during normal use of the gloves."

9.3.3.5

Add the following subclause after 9.3.3.4:

"9.3.3.5 Other lacks (gaps) in the vibration-reducing material

In some constructions of the gloves (for example in large nubs), the gaps can also lie in other areas. Likewise, these gaps should not be too large in relation to the material thickness.

The evaluation should follow the procedure defined in Annex C."

Annex C

Add the following annex after Annex B, before the Bibliography:

Annex C
(normative)

Test procedure for verification of the gaps (interspace) between the vibration-reducing material

C.1 General

Depending on the construction of the gloves, there may be gaps in the vibration-reducing material for improving dexterity. There could also be glove configurations with “open surfaces” on the outer coating of the gloves within the gripping surfaces.

NOTE 1 Open surfaces are, for example, nubs or other elevations on the surface.

NOTE 2 Gaps are regions or interspaces of significantly reduced vibration isolation properties.

Since the vibration transmission is determined in the palm of the hand, it shall be ensured that the vibration-reducing material properties meet minimal protection requirements at all points within the palm of the hand.

C.2 Measurement of the vibration-reducing material thickness within the gap areas and the grip area of the adapter

The material thickness is examined over the entire gripping surface by means of a defined pressure load test. The measurement shall be carried out on a solid and straight surface. A force of 4,5 N ± 0,4 N shall be applied perpendicular to the straight surface to the gloves at specific points identified within the grip area of the hand-held adapter and within the gap areas.

For preparation and to identify the gaps, the material on the back of the glove (back of the hand) shall be removed.

As shown in Figure C.1, in the area where the adapter lies in the palm of the hand during the measurement of vibration transmissibility (grip area of the adapter), at least five measuring points shall be identified to determine the thickness of the vibration-reducing material. The measuring points shall be evenly distributed in the grip area of the adapter and shall be located on the vibration-reducing material.

During measurement, the glove shall be pressed flat against the bottom of the measuring device while exerting the required force without pressing in the immediate vicinity of the measuring point. As soon as the position of the probe tip has stabilized (e.g. after 5 s) the material thickness shall be determined. After a pause of 10 s, the process shall be repeated at the same measuring point. For the measurement of the thickness within the grip area of the adapter, five measurements shall be made at each of the five measuring points.

The arithmetic mean of the 25 measurements, i, shall then be evaluated to determine the material thickness in the grip area of the adapter, $\bar{M}$, as shown in Formula (C.1):

$$\bar{M} = \frac{1}{25}\sum_{i=1}^{25} M_i \tag{C.1}$$

In a similar manner, and as shown in Figure C.1, for each gap to be measured (e.g. between thumb and palm, between finger and palm), at least three measuring points with similar gap sizes shall be

identified. At each of these measuring points, five measurements of the thickness shall be made, while maintaining the required force for 5 s, and allowing a pause of 10 s between each measurement.

The arithmetic mean of the n measurements, i, shall then be calculated to determine the material thickness of each of the gap areas of the gloves, $\bar{G}$, as shown in Formula (C.2):

$$\bar{G} = \frac{1}{n}\sum_{i=1}^{n} G_i \tag{C.2}$$

For a glove with an "open surface", an aluminium ring shall be placed around each measuring point and pressed towards the bottom in order to fix the glove. The aluminium ring shall have the following dimensions:

a) outside diameter: 45 mm ± 1 mm;

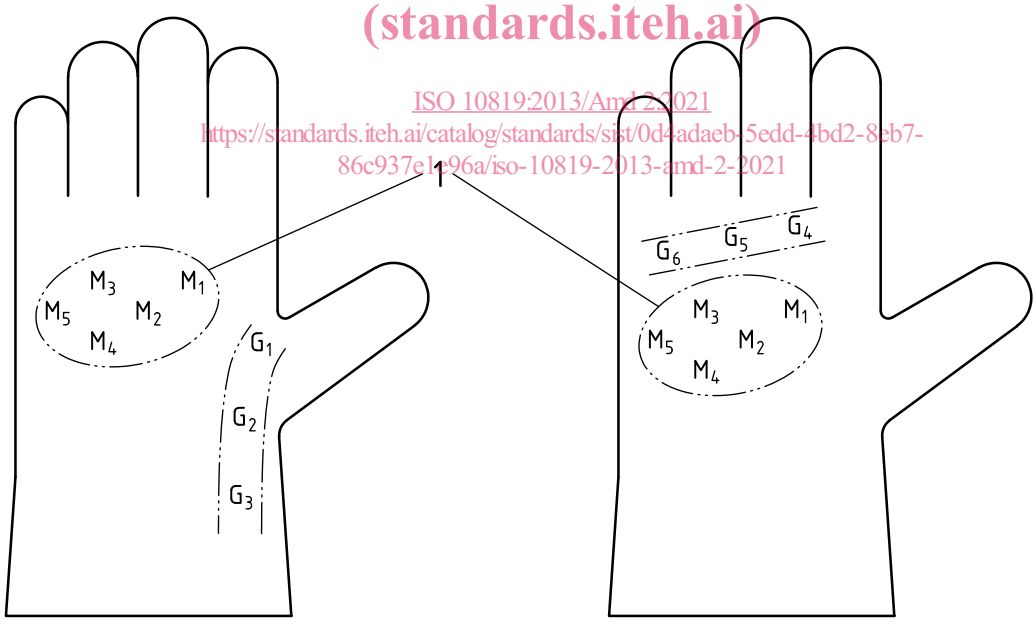
b) inside diameter: 25 mm ± 0,5 mm;

c) thickness: 2 mm ± 0,4 mm.

The inside (contact surface to the hand) should rest flat on the surface of the test setup. The surface texture of the material should not be altered by the ring.

NOTE 1 The mechanical coupling of an open-surface glove with an aluminium ring can affect the measurement. Excessive stress on the ring can push out the material surface, which leads to an overestimation of the material thickness.

In the example in Figure C.1, G_1 to G_3 and G_4 to G_6 each have n = 15



Key

1	measuring area of the adapter (position of the adapter in accordance with 6.1.5)
M_1 to M_5	measuring points of the vibration-reducing material in the grip area of the adapter
G_1 to G_3	measuring points of the vibration-reducing material within the gaps between the thumb and the palm
G_4 to G_6	measuring points of the vibration-reducing material within the gaps between the fingers and the palm

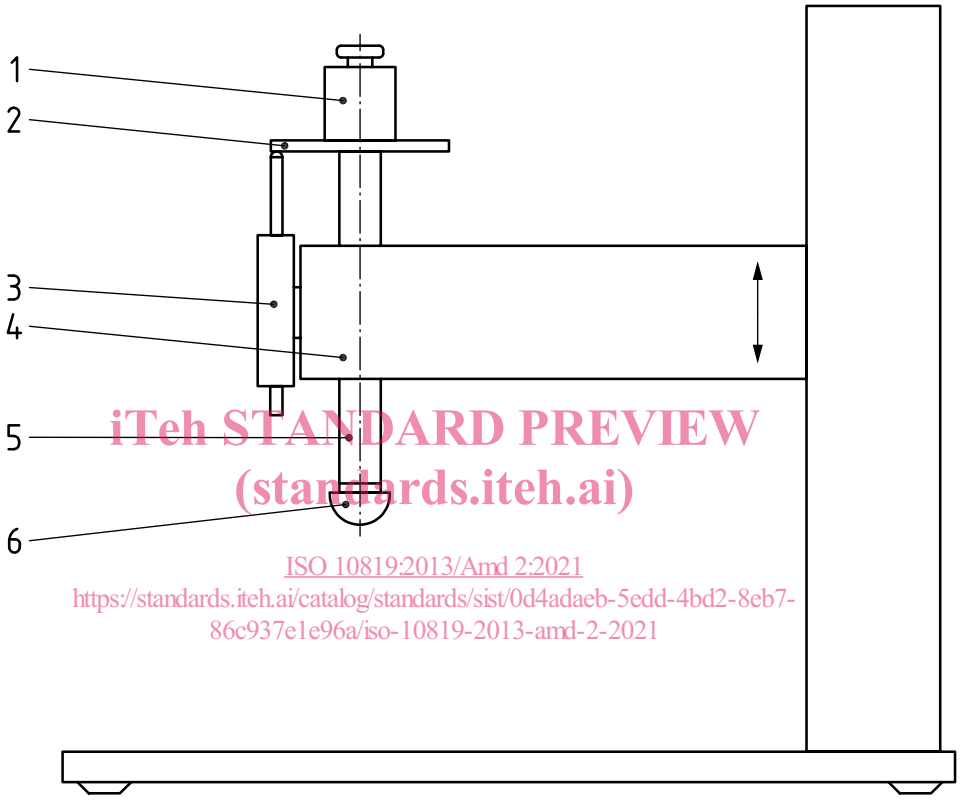
Figure C.1 — Position of the measuring points within the gaps and the grip area of the adapter

The measurement points should be within 10 mm of the extremities of the vibration reducing material. Depending on the construction of the glove, additional measuring points may be required.

C.3 Example of a test setup

An example of a measuring device is shown in Figure C.2. The measurement should be carried out on a solid and straight surface. The measuring device consists of a height-adjustable cantilever arm at the end of which a rod is pushed through a pipe holder. The rod should slide through the holder without resistance. A support plate is attached to the upper end of the rod for the positioning of the weights and a hemispherical probe tip with a radius of 10 mm ± 0,5 mm is attached to the lower end of the rod.

A dial gauge with a measuring range from1 mm to 10 mm with an accuracy of 1/10 mm is attached to the cantilever arm. The support plate should press down the dial gauge rack when lowering to exert the required force on the material.



Key

1 weight
2 support plate
3 dial gauge
4 height adjustable cantilever arm
5 rod
6 replaceable hemisphere

Figure C.2 — Example of a device for measuring the material thickness under a pressure load

The height of the cantilever arm should be adjusted so that the hemispherical probe tip is at the lowest position above the support plate and the dial gauge should show the maximum measurable value in this position.

If, when lowering the cantilever arm, the first contact of the hemispherical probe tip with the glove occurs before the contact of the support plate with the dial gauge rack, the cantilever should be moved upwards by a certain distance. This distance should be added to the maximum measurable value of the dial gauge when determining the material thickness.

Before each measuring operation with the device shown in Figure C.2, the support plate should be brought to a height at which it does not touch the dial gauge rack. For the measurement, the hemispherical probe tip should be set down slowly at each measuring point. As soon as the probe tip has been completely put down on a measuring point, the material thickness on the dial gauge should be read off after 5 s and recorded. After each measurement, the support plate should be lifted to the initial height so that the probe tip has completely lost contact with the glove at the measuring point.

C.4 Test requirements

The ratio of the material thickness within the gap area to the material thickness in the grip area of the adapter shall be determined using Formula (C.3):

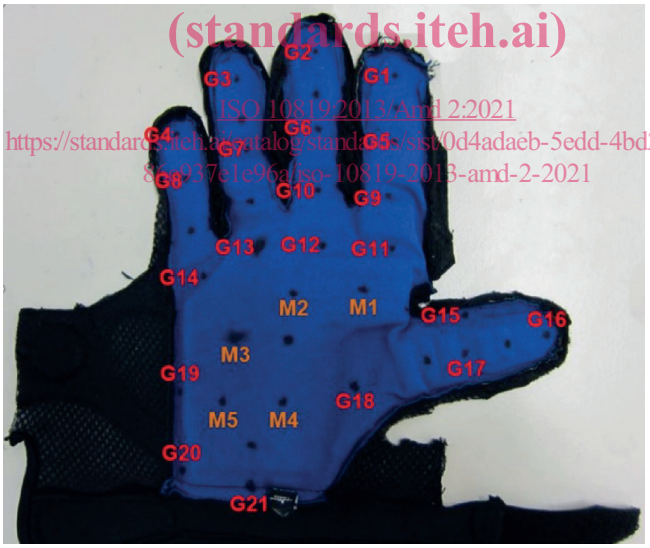
$$Q = \frac{\bar{G}}{\bar{M}} \tag{C.3}$$

The requirements of 9.3.3 are fulfilled if the value $Q \geq 0{,}6$.

C.5 Documentation

The position of the measuring points shall be documented. A picture may be suitable, as shown as an example in Figure C.3.

Figure C.3 shows the measurement locations M1 to M5 and G1 to G6 that are also shown in Figure C.1. The additional points shown in Figure C.3 are further examples of measurement points.



Key

M1 to M5 measurement point of the material

G1 to G21 measurement point of the gap

Figure C.3 — Example of how the measuring point could be documented with a picture