

Standard in Review ISO 10819:1996(E)

Explanation of the European Standard

Mechanical vibration and shock

Hand-arm vibration

Method for the measurement and evaluation of the vibration transmissibility of gloves at the palm of the hand

This European Standard, published in 1996, was prepared by the European Committee for Standardization (CEN) "in response to the growing demand to protect people from the risks of vibration damage caused by exposure to hand-transmitted vibration."

All member countries were required to implement ISO 10819 as a national standard by December 1996. Countries which are members of CEN are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The standard furnishes the technical information needed for laboratory testing and measurement of the vibration transmissibility of gloves. Measurements are made in the palm of the hand and do not include the fingers. The standard notes that a different measurement procedure will be needed to make measurements at the fingers.

The introduction to the standard states: "Within the current state of knowledge, gloves do not provide significant attenuation in the frequency range below 150 Hz. Some gloves may provide amplification in this frequency range. . .However, it must be emphasized that an important purpose of gloves is to keep the hands warm and dry, as this may help to limit some vibration-induced effects".

1. SCOPE

This standard defines a "screening test" for vibration transmission to the palm of the hand through a handle vibrating in the frequency range of 31.5 Hz to 1250 Hz. "The transmissibility of vibration is measured and reported for two input spectra, which are representative of the vibration of some tools and may be reported as a function of frequency."

The standard notes that it does not assess the health risk resulting from vibration.

2. NORMATIVE REFERENCES

Throughout the standard, reference is made to previous European standards which contain related information and data. They include:

EN 420

General requirements for gloves

ENV 25349

Mechanical vibration - Guidelines for the measurement and the assessment of human exposure to hand-transmitted vibration (ISO 5349:1986)

ENV 28041

Human response to vibration - Measuring instrumentation (ISO 8041:1990)

EN 61260

Electroacoustics - Octave-band and fractional-octave-band filters
(IEC 1260:1995)

ISO 2041

Vibration and shock - Vocabulary

ISO 5805

Mechanical vibration and shock affecting man - Vocabulary

3. DEFINITIONS

The definition of transmissibility used in this standard is:

"The ratio of the accelerations measured at the surface of the hand and at the reference point. Transmissibility values greater than 1 indicate that the glove amplifies the vibration. Values lower than 1 indicate that the glove attenuates the vibration."

4. SYMBOLS AND ABBREVIATIONS

This section defines those used in the standard.

5. MEASURING PRINCIPLE AND EQUIPMENT

Gripping force and feed force are measured using a "shaker" excitation system. These measurements are made at the surface of the handle and inside the glove between the hand and glove. "The vibration transmissibility of the glove is calculated as the difference in vibration transmissibility from handle to hand with and without the glove." Because the gripping and feed force of the shaker are related to each other, the values of the two forces are displayed continuously so the operator can adjust them to the required values.

The measuring equipment includes a frequency analyzer, preferably twin channel (narrow band and one-third octave band), two transducers and two channels of measuring equipment.

Additional measurement specifications are for method of transducer mounting at handle and hand, frequency analysis, gripping force measuring system, feed force measuring system, vibration excitation system, geometrical characteristics and performance.

6. MEASUREMENT CONDITIONS AND PROCEDURE

Test subjects are specified as three adults with hand sizes from 7 to 9. Three different gloves should be tested: one for each subject. Other specified conditions are:

gripping force: to be maintained at 30 N (+-) 5 N throughout test

feed force: displayed continuously and maintained at 50 N (+-) 8 N

room temperature: 20 degrees C (+-) 5 degrees C

humidity: shall be below 70 per cent and shall be reported

conditioning of gloves: stored at specified temperature for at least 30 minutes and worn by subject for at least three minutes before testing

fitting of gloves: size shall be chosen according to EN 420 (General requirements for gloves)

test period: at least 30 seconds for weighted measurements or third-octave band analysis; shall allow averaging of at least 60 spectra if constant bandwidth analysis is applied

The posture of the test subject-operator is carefully defined, including the angle of the wrist and the angle of the elbow, which should not touch the body during the test.

The vibration signals to be measured at the handle gripped by the subject fall into two spectra:

Vibration spectrum M: 31.5 Hz to 200 Hz (for third-octave bands (+-) 1 dB)

Vibration spectrum H: 200 Hz to 1250 Hz (for third-octave bands (+-) 1 dB)

The mathematical definitions of these vibration signals, found in Annex A of the standard, are:

Spectrum

L*	8	31.5	0.82
M	31.5	200	1.52
H	200	1000	10.0

*NOTE: According to the current state of knowledge gloves do not provide significant vibration attenuation below 150 Hz. If it is necessary to check the vibration transmissibility at low frequencies - e.g. for the testing of gloves purported to provide vibration attenuation in this frequency range - then spectrum L should be used in addition to M and H."

Other items delineated in the testing procedure are the steps to be completed before beginning the tests, how to make the measurements with bare hand and how to make measurements with the gloved hand.

7. EVALUATION OF RESULTS

The steps that are to be followed when calculating the mean corrected transmissibility of gloves are:

Measurement

(3 persons) Location

transducer Evaluation Results

for each spectrum

Bare hand (once) handle awsRb transmissibility

TRsb 6x corrected transmissibility

hand awsPb

With glove (twice) handle awsRg transmissibility

TRsg mean corrected transmissibility

hand awsPg

The formula for calculated transmissibilities of the glove for each vibration spectrum is:

$TRs = TR_{sg} / TR_{sb}$. The formulas used to calculate transmissibilities for each condition are included in Section 7.1 of the standard.

To meet the criteria for antivibration gloves using this standard, the transmissibility in the M spectrum must be less than 1 and in the H spectrum it must be less than 0.6.

Also, to be considered an "antivibration glove" according to this standard, the fingers of a glove must have the same properties (material and thickness) as the palm of the glove. However, in a note, the statement is made that gloves not offering finger protection may still have a beneficial effect in cases where there is no contact between fingers and the vibrating surface.

This section on evaluation recommends that transmissibility as a function of frequency be calculated and provides specified frequencies to be used for third-octave bands and narrow band analysis.

8. TEST REPORT

All items to be included in a report of the vibration transmissibility of gloves are listed. They include: name / address of glove manufacturer, type of glove and if new or used, description of test samples, date of test, equipment used in test, measuring conditions, results and name of laboratory conducting the test.

ANNEXES

Five annexes follow the text of the standard:

Annex A (normative): Mathematical definition of vibration test signals, including Table A.1: "Cut-off frequencies f_c and constant factors c for vibration spectra (filter slopes of 12 dB/octave, Butterworth characteristics)"

Annex B (informative): Example of handle with gripping force measuring systems, including Figure B.1: "Example of handle with gripping force measuring system"

Annex C (informative): Third-octave band spectra of vibration test signals, including Table C.1: "Spectrum M" and Table C.1: "Spectrum H" and Figure C.1: "Spectra M and H" (graph with Frequency and Acceleration axes)

Annex D (informative): Bibliography

Annex ZA (informative): Clauses of this European Standard addressing essential requirements or other provisions of EU Directives.

NOTE: The International Standard on which this paper is based, reference number

ISO 10819:1996(E), may be ordered in the United States from ANSI-American National Standards Institute, 212/642-4900 or FAX 212/302-1286. The publisher's address is International Organization for Standardization, Case Postale 56, CH-1211 Geneve 20, Switzerland.

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