AS 2679—1984

Australian Standard®

VIBRATION AND SHOCK— MECHANICAL VIBRATION OF ROTATING AND RECIPROCATING MACHINERY—

REQUIREMENTS FOR INSTRUMENTS FOR MEASURING VIBRATION SEVERITY

This Australian standard was prepared by Committee ME/41, Vibration and Shock. It was approved on behalf of the Council of the Standards Association of Australia on 2 November 1983 and published on 6 January 1984.

The following interests are represented on Committee ME/41:

Association of Consulting Engineers Australia
Australian Mining Industry Council
Australian Shipbuilders Association
Confederation of Australian Industry
Construction Equipment Importers and Manufacturers of Australia
CSIRO, National Measurement Laboratory
Department of Defence
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University of Queensland

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PREFACE

This standard was prepared by the Association's Committee on Vibration and Shock in response to a request from Australian industry and governmental institutions.

The standard is concerned with the requirements for instruments for measuring vibration severity.

This standard is based on ISO 2954—Mechanical Vibration of Rotating and Reciprocating Machinery—Requirements for Instruments for Measuring Vibration Severity.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

VIBRATION AND SHOCK—MECHANICAL VIBRATION OF ROTATING AND RECIPROCATING MACHINERY—REQUIREMENTS FOR INSTRUMENTS FOR MEASURING VIBRATION SEVERITY

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard specifies the requirements with which measuring instruments for vibration severity of reciprocating and rotating machinery should comply particularly for the comparison of one machine with another.

Each instrument covered by this standard is designed to give a direct indication or recording of machine vibration severity, which is defined as the true root-mean-square value of the vibration velocities measured.

1.2 APPLICATION. Instruments complying with the requirements of this standard are suitable for use in carrying out the procedures specified in AS 2625 and are designated 'measuring instruments for vibration severity in rotating and reciprocating machines'.

1.3 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 2625 Rotating and Reciprocating Machinery—Mechanical Vibration
Part 1—Basis for Specifying Evaluation Standards

AS XXXX Vibration and Shock—Mechanical Mounting of Accelerometers*

AS Z41 Octave, Half Octave and One-third Octave Band Pass Filters Intended for the Analysis of Sound and Vibrations.

* In course of preparation.

SECTION 2. GENERAL REQUIREMENTS FOR VIBRATION MEASURING INSTRUMENTS

2.1 GENERAL. A vibration measuring instrument usually consists of the following components:

(a) A vibration transducer.

(b) An indicator set which contains an amplifier, correcting filter networks for the frequency response, and an indicating or recording instrument.

(c) A power supply system.

The requirements described in this Section apply to the general characteristics of the complete assembly of the transducer, and the true root-mean-square velocity ($V_{r.m.s.}$) indicator set. Sections 3 and 4 contain the detailed requirements for each of these main units, respectively.

2.2 FREQUENCY CHARACTERISTICS. The vibration severity measuring instrument shall have a nominally flat frequency response between 10 Hz and 1000 Hz. The sensitivity shall decrease for frequencies outside this range, in the manner defined in Fig. 2.1.

The sensitivity within the frequency range 1 Hz to 10 000 Hz relative to the reference sensitivity at 80 Hz shall be within the limiting values given in Table 2.1. The relative sensitivity outside this frequency range shall not exceed 0.01.

NOTE: In some cases, it may be necessary to limit further the measuring-frequency range at its upper or lower boundaries to avoid interfering vibrations which are irrelevant to the assessment of the vibration characteristics of a machine. For this purpose, the instrument may be equipped with additional high-pass or low-pass filters. It is recommended that the cutoff frequencies and edge steepness of these filters are selected in accordance with the requirements outlined in AS Z41.

Where the measuring-frequency range is narrowed down by additional filters, the measured value should not be used for assessing the vibration severity in accordance with AS 2625, Part 1. To avoid errors, it is necessary to state the cutoff frequencies for the measuring-frequency range as well as the measured value, e.g. $V_{r.m.s.}$ (40 Hz to 100 Hz) = 7.5 mm/s.

2.3 MEASUREMENT RANGE. The selection of the measurement range shall be such as will ensure that the indication of the lowest level of the vibration severity to be measured has a resolution as specified in Clause 4.1.2. The minimum and maximum levels of the vibration severity range (e.g. in accordance with Table 1 of AS 2625, Part 1) shall be stated, e.g. 'measuring instrument for vibration severity with measurement range 0.28 mm/s to 28 mm/s'.

2.4 CALIBRATION. The instrument shall be calibrated periodically by exciting the transducer with rectilinear sinusoidal or broadband vibration, the direction of which may deviate by not more than ± 5 percent from that of the sensitive axis of the transducer. The r.m.s. velocity of the calibrating motion shall be known with an uncertainty not greater than ± 3 percent for frequencies between 10 Hz and 1000 Hz. The $V_{r.m.s.}$ in the frequency range (1 Hz to 10 000 Hz) shall not exceed $V_{r.m.s.}$ (10 Hz to 1000 Hz) by more than 1 percent.

The instrument should be calibrated at or near the frequencies shown in Table 2.1, between 10 Hz and 1000 Hz inclusive, at the highest achievable velocity in the range stated below.

The instrument shall be calibrated with velocity amplitudes ranging from 30 percent of the full scale deflection on the lowest range to 100 percent of full scale deflection on the highest range. At least five velocity amplitudes shall be selected, two of which include the above values and the others are equally spaced over the linear amplitude range of the instrument at or near the reference frequency of 80 Hz.

NOTE: It is also necessary to verify the frequency characteristic according to the requirements of Clause 2.2.

2.5 LIMITS OF ERROR. The maximum allowable measurement error, including calibration and by all other sources including those detailed in Sections 3 and 4, shall not exceed ± 10 percent at the reference frequency ± 20 Hz.

These limits of error apply over the whole operating temperature range authorized for the instrument (see Clauses 3.8 and 4.3), for all types of attachments to the connecting cable between the vibration transducers and the indicator provided by the manufacturer (see Clause 3.14), and for a ± 10 percent fluctuation in the supply voltage.

The uncertainty in any given measurement shall take into account all the above sources of error.

2.6 POWER REQUIREMENTS. The input power requirements for the transducer and indicator set shall be specified by the manufacturer.