AS 3710—1989

Australian Standard®

Vibration and shock—Balancing machines—Enclosure and other safety measures

This Australian Standard was prepared by Committee AV/9, Vibration and Shock, Application. It was approved on behalf of the Council of Standards Australia on 17 March 1989 and published on 13 October 1989.

The following interests are represented on Committee AV/9:

Australian Environment Council

Australian Road Research Board

Confederation of Australian Industry

CSIRO, National Measurement Laboratory

Department of Defence

Department of Minerals and Energy

Institute of Quarrying

Institution of Engineers, Australia

Monash University

National Association of Australian State Road Authorities

National Association of Testing Authorities, Australia

Royal Institution of Naval Architects

The Australian Gas Association

University of Melbourne

University of Technology, Sydney

This Standard was issued in draft form for comment as DR 88066.

AS 3710—1989

Australian Standard®

Vibration and shock—Balancing machines—Enclosure and other safety measures

First published as AS 3710—1989.

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 5679 X

PREFACE

This Standard was prepared by the Standards Australia's Committee on Vibration and Shock—Application. It is technically equivalent to ISO 7475—1984, *Balancing machines—Enclosure and other safety measures*. Variations from ISO 7475 have been highlighted by the use of marginal bars.

The Standard is in agreement with current Australian practices for the use of interlocks in machine enclosures and the testing of safety glass barriers outlined in AS 1337, *Eye protectors for industrial applications*.

CONTENTS

FOREWORD

In the designing of balancing machines, efforts are made to minimize hazards arising from the use of the machines themselves. Rising demand for still greater safety in the working environment, however, requires additional protection, especially for the rotor to be balanced. Potential hazards to the operator or the surrounding workshop area may exist, e.g. by personnel coming into contact with machine components or the rotor, by rotor components or unbalance-correction masses detaching and flying off, or by the rotor lifting from the supports or disintegrating. Particular dangers are posed by protruding rotor components or by those which may become detached during rotation in the balancing machine. These potential hazards may theoretically increase with rotor size and balancing speed, but they are generally minimized by appropriate rotor design.

Special purpose balancing machines, e.g. those used in the mass production automotive industry, normally incorporate all necessary safety measures because the workpiece, as well as the operating conditions of the machine, are known and can be taken into account by the machine manufacturer. For multipurpose balancing machines, however, where the workpieces to be balanced are generally unknown to the machine manufacturer, and are thus beyond his control, normal safety measures are limited to obvious hazards, e.g. end-drive coupling covers and drive belt covers.

STANDARDS AUSTRALIA

Australian Standard

Vibration and shock—Balancing machines—Enclosures and other safety measures

1 SCOPE. This Standard specifies requirements for enclosures and other safety measures used to minimize hazards associated with the operation of balancing machines under a variety of rotor and balancing conditions. It defines different classes of protection that enclosures and other protective features provide and describes the limits of applicability for each class of protection.

Special enclosure features, such as noise reduction, windage reduction, and vacuum (which is required to spin certain rotors at the balancing speed), are not covered by this Standard.

2 REFERENCED DOCUMENTS. The following documents are referred to in this Standard.

AS
1337 Eye protectors for industrial applications

2606 Vibration and shock—Vocabulary

2641 Vibration and shock—Balancing—Vocabulary

3 DEFINITIONS. For the purpose of this Standard, the definitions given in AS 2606 and AS 2641 apply.

4 ACCIDENT PROBABILITY AND ITS EFFECT ON SAFETY MEASURES. Most local or national regulations require certain minimum safety measures to be taken. Observance of such requirements in conjunction with the recommendations contained in this Standard will generally provide an adequate measure of protection to the balancing machine operator and surrounding workshop personnel. There may be applications, however, where the recommended enclosures or other safety measures are so costly, or their use so time-consuming, that other safety precautions, such as vacating the surrounding area for a sufficient distance, remote control of the balancing facility, or work outside normal hours, etc, have to be considered.

The consideration of accident probability may be important if a rotor needs to be balanced or spin-tested at or above its service speed, where major rotor failure cannot be excluded with as much certainty as during low-speed balancing. Maximum service and spin-test speeds are generally well below the speed where major rotor failure may be expected.

On the other hand, a rotor being balanced at low-speed may consist of an assembly of several components, such as a bladed turbine wheel. It is then important to consider whether an enclosure for low-speed balancing should withstand penetration of a turbine blade, or whether it is sufficient to protect against unbalance-correction masses that might fly off during balancing. If the probability of blade separation is practically non-existent, a light enclosure which just protects against correction masses may be sufficient.

Since this Standard deals with balancing machines and safety measures in general, no details of the risk can be stated for specific rotor types and balancing facilities. Individual investigations, based on actual rotor parameters, will probably be required in each specific case. In this connection, risk analysis of possible accidents should include the characteristics of the balancing machine itself. For the extent of the ensuing damages, it may be of decisive importance to know how much unbalance can be endured by its supports and bearings due to partial rotor failure, e.g. rotor components becoming detached.

5 POSSIBLE HAZARDS AND PRECAUTIONARY MEASURES.

5.1 General. Hazards from rotating machine components are generally covered by the safety regulations of statutory authorities. Hazards associated with the spinning rotor in a balancing machine may be separated into several different categories and precautions may be taken in a variety of ways. Generally recognized hazards and the appropriate precautions are described in Clauses 5.2 to 5.9.

5.2 Disengagement or failure of the end-drive coupling. One end of the universal-joint driver may remain coupled to the balancing machine drive or the spinning rotor, with the free end whipping around. The common device for protection in such a case is an enclosure around the universal-joint shaft. More complete protection is offered by machine enclosures.

5.3 Operator becoming entangled in the belt-drive. The usual protective devices to prevent an operator from becoming entangled in a belt-drive are belt covers over the motor and tensioning pulleys. More complete protection is offered by machine enclosures.

5.4 Axial rotor movement off the machine supports due to excessive axial thrust from skewed support rollers or windage. Axial rotor movement usually does not occur on machines with end-drive, provided that the end-drive coupling prevents axial motion. On belt-drive machines, axial motion is prevented by axial thrust retainers.

5.5 Rotor lifting out of the machine's open bearings. The lifting of a rotor out of open bearings (e.g. due to excessive initial unbalance, or shifting or separation of large masses during rotation) may be prevented by the use of closed bearings or, for support rollers, by safety restraints.

5.6 Operator coming into contact with any part of the spinning rotor. Contact by the operator with the spinning rotor (e.g. with blades or other protruding components) may be prevented by guards, or enclosures.

5.7 Small particles separating from the rotor during rotation. Appropriate protection against particles separating from the rotor (e.g. welding bead, bolt, key, or unbalance-correction mass) may be provided for very small rotors by eye protectors or shields, or for larger rotors by enclosures.