AS 2193—1978

Australian Standard®

Methods for the calibration and grading of force-measuring systems of testing machines

The following scientific, industrial and governmental organizations and departments were officially represented on the committee entrusted with the preparation of this standard:

Aluminium Development Council
Associated Chambers of Manufactures of Australia
Australian Institute of Metals
Bureau of Steel Manufacturers of Australia
Department of Productivity
Materials Research Laboratories—Department of Defence
Metal Trades Industry Association of Australia
National Association of Testing Authorities
National Measurement Laboratory
Railways of Australia Committee
Society of Automotive Engineers—Australasia
Universities

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PREFACE

This standard was prepared by the Association's Committee on Mechanical Testing of Metals as the metrication and revision of AS B128—1963, which it accordingly supersedes.

During the preparation of the standard the committee considered the following documents:

ASTM E 4	Verification of Testing Machines
ASTM E 74	Standard Methods of Calibration of Force Measuring Instruments for verifying the Load Indication of Testing Machines
ISO R/147	Load Calibration of Testing Machines for Tensile Testing of Steel
ISO R/376	Calibration of Elastic Proving Devices
BS Draft 74/42152 DC	Methods for the Verification of Forces Applied by Materials Testing Machines.

This standard covers the static calibration of force-measuring systems of testing machines. It is realized that for machines employing high rates of force application, dynamic calibration methods may be more appropriate, but these are outside the scope of this standard. However, some notes on the response of materials testing equipment have been included in Appendix C.

This standard requires reference to the following Australian standards:

AS 1376 Conversion Factors

AS 1545 Methods for the Calibration and Grading of Extensometers.

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STANDARDS ASSOCIATION OF AUSTRALIA

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METHODS FOR THE CALIBRATION AND GRADING OF FORCE-MEASURING SYSTEMS OF TESTING MACHINES

FOREWORD

Testing machines referred to in this standard are those known as force-testing machines. These may be classified as tension, compression, or transverse bending machines depending on the mode of straining applied to the test piece. Some machines have provision for more than one mode of straining.

It is necessary for machines to be maintained in good working order and condition. Regular services of all machines is recommended, the frequency of the servicing being dependent on the frequency and conditions of use of a machine. All machines should be calibrated periodically so that results obtained from a machine are reliable and consistent with those obtained from other machines. However, the test data obtained depend also on the testing techniques used. It is important for users of this standard to make reference to the specified method of test and to printed literature provided by manufacturers of testing equipment.

Calibrating authorities and testing machine users should note that calibration procedures specified in this standard apply only to statically applied forces.

Special procedures, which are outside the scope of this standard, should be followed for dynamic calibration of testing machines employing high rates of force application (see Appendix C).

SECTION 1. SCOPE, APPLICATION AND DEFINITIONS

1.1 SCOPE. This standard specifies requirements for the static calibration of the force-measuring systems of testing machines used for measuring the strength and other properties of materials, components, products and assemblies.

The standard deals with the following:

Terms, definitions and principle of calibration (Section 1).

Grading requirements (Section 2).

Procedures for the calibration of force-measuring systems (Section 3).

Calibrating devices (Section 4).

NOTES:

1. Extensometers used in conjunction with tension and compression testing machines are dealt with in AS 1545, Methods for the Calibration and Grading of Extensometers.

2. Supplementary information necessary for the calibration is given in Appendix A.

1.2 APPLICATION. This standard applies to testing machines which indicate in terms of the SI unit of force, the newton (N), or in arbitrary units. However, during the period of change to SI units, the use of the former technical units of force is also permitted.

NOTE: Reference should be made to AS 1376, Conversion Factors, for the relationship between the newton and the technical units of force.

1.3 DEFINITIONS. For the purpose of this standard the following definitions apply:

1.3.1 Terms Relating to Testing Machines.

1.3.1.1 *Testing machine*—a device for applying forces to a test piece or test specimen where the forces are measured during testing or applied as discrete values of force.

NOTES: Testing machines may apply forces in tension, in compression or in both. In the last case they are known as universal testing machines.

1.3.1.2 *Force scale*—the form of display used to indicate the magnitude of the force, whether directly or indirectly. The display may be in the form of a graduated scale, digital readout, oscillogram or computer printout.

1.3.1.3 *Scale factor*—a factor by which the reading of a machine scale is multiplied to obtain the corresponding value of indicated force but not including a factor to correct for errors of a force-measuring system.

NOTE: A scale factor applies to machines indicating in units other than force and to machines using a single force scale for more than one operating range. This factor may not be constant over the calibration range.

1.3.1.4 *Machine capacity*—the maximum force which a machine is designed to apply and measure.