

Australian Standard[®]

**METROLOGY—SYMBOLS FOR
EXPRESSING UNCERTAINTY OF
MEASUREMENTS**

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Bureau of Steel Manufacturers of Australia
CSIRO, Division of Applied Physics
CSIRO, Division of Manufacturing Technology
Confederation of Australian Industry
Department of Defence
Department of Technical and Further Education, N.S.W.
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PREFACE

This standard was prepared by the Association's Committee on Engineering Tolerancing Systems, Metrology and Surface Quality, to meet a significant need in clarifying reporting of the results of measurements and calibration. To have any real meaning, a report on the results of measurements and calibrations must be qualified by a statement of uncertainty. This statement indicates the reliability of the results reported.

Statements of uncertainty are now becoming universal in metrological reporting, but such statements, also universally, lack any indication of the level of confidence to be associated with them. Without this indication the statement of uncertainty is virtually useless.

This standard gives a simple scheme of symbols to enable the level of confidence associated with a statement of uncertainty to be clearly stated.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

METROLOGY—SYMBOLS FOR EXPRESSING UNCERTAINTY OF MEASUREMENTS

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard sets out symbols and their use, for the expression of uncertainty relating to the results of measurements and of calibration of measuring instruments, and the associated level of confidence, to be used in metrological reports.

NOTE: The standard does not give information on how to derive the value for uncertainty. In many cases, the values quoted for uncertainty are based solely on experience. Occasionally, they may be derived statistically, or by a combination of experience and statistical evaluation.

1.2 APPLICATION. The standard gives information on a system of symbols relating to statements of uncertainty and the level of confidence which is associated with such statements.

The standard is intended for adoption by engineers, scientists, inspection personnel and the like, associated with writing metrological reports and statements.

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

AS 1514 Glossary of Terms used in Metrology
Part 1—General Terms and Definitions

AS 2706 Numerical Values—Rounding and Interpretation of Limiting Values

1.4 BASIS OF STANDARD. A statement of the uncertainty to be associated with the result of a measurement or with the performance (calibration) of a measuring instrument is meaningless unless there is also an accompanying statement indicating the level of confidence on which the stated uncertainty has been based.

For example, it is particularly important that the level of confidence of the uncertainty to be associated with the measured value of a measurement standard be stated, in order that uncertainty can be taken into account, in an appropriate way, when the uncertainty associated with subsequent measurements based on that measurement standard are being assessed.

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

NOTE: For other definitions used in metrology, see AS 1514, Part 1.

1.5.1 Uncertainty of measurement—that part of the expression of the corrected result of a measurement which defines the range of values within which the true value or, if appropriate, the accepted true value is estimated to lie.

NOTE: Uncertainty is a statement of the total extreme (limiting) errors (both systematic and random) from all sources. It is an appropriate summation of all the residual errors, after correction, of the result of measurement. For further information, see Appendix A.

1.5.2 Level of confidence—a numerical or quantitative statement of the probability that the actual (but unknown) value of a measured quantity will lie within certain limiting values.

Example: A level of confidence of 99 percent or 0.99 means that there are 99 chances in 100 that the true value lies within the stated limiting values. Conversely, it also means that the likelihood that the true value lies outside those limits is 1 in 100.

1.6 ROUNDING OF NUMERICAL VALUES. For the rounding of numerical values used in metrological reports, see AS 2706.