AS 2217—1979

Australian Standard®

NOMENCLATURE OF SINGLE-POINT CUTTING TOOLS

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

Australian-British Trade Association

CSIRO, Division of Materials Science

Confederation of Australian Industry

Manufacturers and users of cutting tools

Universities

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PREFACE

This standard was prepared by the Association's Committee on Single-point Cutting Tools in recognition both of the need to rationalise the nomenclature and definitions of the elements and geometrical features of single-point cutting tools, and of the considerable activity and developments in cutting tool nomenclature that are taking place at national and international levels.

The standard provides a reference for nomenclature, defines terms for certain basic concepts concerning single-point cutting tools, and deals with those features which are necessary to define the geometry of the cutting part. Threading tools and form tools are not, however, included in this standard.

During the preparation of this standard the committee considered the following standards and acknowledgement is made of the assistance received therefrom:

ISO 3002/I	Geometry of the Active Part of Cutting Tools Part I—General Terms, Reference Systems, Tool and Working Angles
BS 1296	Specification for Single Point Cutting Tools Part 2—Nomenclature

The committee also considered findings originating from the University of Melbourne and wish to record their appreciation of the work done by the University in this regard.

The attention of users of this standard is particularly drawn to the Foreword which discusses the background to the preparation of this standard and the approach philosophy. The standard is amply illustrated but to retain the legibility of the drawings and to avoid the breaking up of the text, the illustrations referred to in the main body of the text have been grouped to form Section 8.

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FOREWORD

Over the years various sets of geometrical features and associated nomenclature for the specification of different types of tools have evolved, with major differences existing for the same type of tool. A notable example is that of the specification of the ordinary lathe tool, where no less than six different methods (sets of angles) and corresponding nomenclature have been standardized or proposed. Often different nomenclature has been used for the same geometrical features.

The need to rationalize the nomenclature and definitions of the elements and geometrical features of the cutting part of the same type, and preferably all types of tools has been recognized for many years. This task has been undertaken by an ISO working group* established in 1960 which chose to concentrate on the active part of all types of cutting tools by defining the geometrical features at any selected point on the relevant cutting edge. Considerable progress has since been made, resulting in the publication of International standard ISO 3002/I, Geometry of the Active Part of Cutting Tools—Part I: General Terms, Reference Systems, Tool and Working Angles. This ISO standard includes the various sets of angles (methods) used to specify the geometry of the cutting part of single-point tools in previous national standards or proposed in research literature and applies them to the active part of all types of tools including twist drills and milling cutters. The common terminology developed, with its associated definitions, is intended to provide a framework on which appropriate standards for individual types of tools can be established.

British Standard 1296: Part 2:1972, Single-point Cutting Tools—Nomenclature (published in anticipation of complete international agreement) is based on principles and terms developed by ISO. However, the British standard adopts a particular set of angles referred to as the normal rake method for specifying the geometry of the active part of single-point tools as the preferred method in the UK. This method supersedes the British maximum rake method used in the previous British standard and draws on some of the angles included in ISO 3002/I.

In preparing this standard, the committee constantly endeavoured to adhere to the concepts and terminology in the corresponding ISO and British standards, while being primarily concerned with single-point cutting tools. The committee has considered the usefulness of the proposed two systems of planes and associated ‘working’ and ‘tool’ angles, as well as the anticipated third ‘machine reference’ system for standardizing tool setting angles and procedures noted in both of the abovementioned British and ISO standards.

On the basis of main objectives of geometrical tool specifications and the common single-point tool cutting part shape, the proposed ‘tool-in-use’ and ‘tool-in-hand’ systems of planes and associated angles have been assessed and incorporated in this Australian standard. However, a third system of planes and motions called the ‘tool design’ system and its corresponding ‘design’ angles has been developed and the geometrical features defined in a manner comparable to those in the above two systems. The ‘tool design’ system describes the geometry of the active part of the tool in the operating position intended by the tool designer.

The constant ‘design’ angles at any selected point on the cutting edge approximate the variable, dynamic, effective or ‘working’ angles of the ‘tool-in-use’ system for many common turning operations. The ‘design’ angles can also uniquely describe the geometry of the active part of the tool in the vicinity of the cutting edges.

Furthermore, these angles are constant from point to point on the relevant straight edges of the common single-point tools so that these may be used to describe the cutting part shape to be manufactured by means of a convenient code or tool ‘signature’.

When the ‘design’ angles are specified according to the normal rake method, these become of fundamental importance to the mechanics of cutting of common turning operations. The angles may also provide some indication of the cutting performance characteristics.

Thus the combination of the normal rake method and ‘tool design’ system satisfies many desirable practical requirements often considered as main objectives of geometrical tool specifications. As such, this combination has been recommended as the preferred method/system combination for this Australian standard.

Further advantages may be obtained by this combination with respect to the ‘ease of grinding’ objective. For the common straight shank turning tool set in ‘classical operation position’ with zero setting angles, the ‘tool design’ and ‘tool-in-hand’ systems coincide so that the ‘design’ and ‘tool’ angles are identical and can be directly used on the vice axes for correctly grinding the tool to the normal rake method. In a number of other common cases such as tangential tools (held in roller box tool holders), the

* International Organization for Standardization ISO/TC29/-/WG 20.

tool setting angles are not zero but the ‘design’ angles can be directly ground by means of a pre-designed fixture simulating the tool holder.

While the ‘tool design’ and ‘tool-in-hand’ systems and corresponding angles can often coincide in practice, this is not always the case for single-point tools. A geometrical and practical distinction between these two systems has been considered necessary by the committee for the purpose of this Australian standard.

Explanatory notes and examples have been included in the appendices to assist the user of this standard.

SECTION 1. GENERAL

SUBSECTION 1.1 TOOL TERMINOLOGY

No	Term	Definition	Fig. ref.
1.1.1	**single-point cutting tool**	A tool terminating in a single cutting part.	8.1-8.7
1.1.2	**tool bit***	Any single-point tool (see also Subsection 2.1) which is intended to be inserted into a tool holder, roller box, or other holding device.	
1.1.3	**shank**	The part of the tool by which it is held.	8.1
1.1.4	**cutting part**	The functional part of the tool which comprises the chip-producing elements. The cutting edges, face and flank are elements of the cutting part.	8.1
1.1.5	**wedge**	The portion of the cutting part enclosed between the face and the flank. It can be associated with either the major or minor cutting edge.	
1.1.6	**tip**	A small piece of cutting material which is permanently attached by brazing, welding or other suitable process on to a seating formed at the end of a tool shank.	8.2
1.1.7	**insert†**	A solid piece of tool material suitably shaped and prepared for immediate use as a cutting medium when inserted and mechanically held in a suitable tool-holder.	
1.1.8	**indexable insert†**	A flat, relatively thin insert, with parallel cutting-face and under-face, shaped to provide several cutting edges for use until dulled, the insert being intended then to be discarded.	
1.1.9	**stick (on-end) insert†**	A relatively long insert of uniform cross-section, shaped to provide several cutting edges on two parallel end-faces, the cutting edges being intended to be redressed before the insert is ultimately discarded.	
1.1.10	**tool holder**	A device with a shank designed to hold mechanically a tool bit, indexable insert or stick insert.	8.2
1.1.11	**heel**	The edge formed by the intersection of the flank and the base.	8.1(a)
1.1.12	**neck**	An extension of the shank, having a reduced cross-section and carrying a relatively small cutting part. Tools having a neck are frequently used for slotting and boring operations.	8.1(b)

SUBSECTION 1.2 TOOL DIMENSIONS

1.2.1	**size**	(a) *Shank of rectangular or square cross-section.* For a tool having a shank of rectangular or square cross-section, size is expressed in millimetres and in the following order: (i) the height (depth) of the shank; (ii) the width of the shank; and (iii) the overall length of the tool. *Example:* A tool having a height of 32 mm, a width of shank of 20 mm, and an overall length of 170 mm is expressed as 32 mm × 20 mm × 170 mm. (b) *Shank of round cross-section.* For a tool having a shank of round cross-section, size is expressed in millimetres and in the following order: (i) diameter of the shank; and (ii) overall length of the tool. *Example:* A tool having a shank diameter of 10 mm and an overall length of 63 mm is expressed as 10 mm × 63 mm.	8.1, 8.2

* A tool bit is normally considered as a single-point tool for the purposes of this standard.

† For the purpose of this standard, inserts are **not** treated as cutting tools. The reference planes and angles will only be applicable to inserts when they are positioned in a tool holder.