ASME B5.50-2009
[Revision of ASME B5.50-1994 (R2003)]

7/24 Taper Tool to Spindle Connection for Automatic Tool Change

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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SETTING THE STANDARD

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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

Periodically, certain actions of the ASME B5 Committee may be published as Cases. Cases are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

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FOREWORD

The Aerospace Industries Association (AIA) developed, in cooperation with machine tool builders and users, standards of toolholder shanks and retention knobs for machining centers with automatic tool changers. AIA/NAS 970 was first published in 1964. The objective of this standardization effort was to reduce the large number of already existing tool shank configurations and to prevent the creation of new ones. The toolholder shanks made by different machine tool builders varied in the methods and in dimensional details of the gripping by the transfer mechanism and retention in the machine tool spindle. The resulting lack of interchangeability created problems of maintaining large toolholder inventories. The AIA standard covered a series of straight and tapered shank toolholders, but the standard never found wide acceptance; one of the reasons given for this was that standardization attempted too “early in the art” would have stifled innovation and development of better tool shanks for machining centers.

During the intervening years, almost every machine tool builder continued to develop their own, often proprietary and very ingenious, toolholder shank configurations for their machining centers. This resulted in an almost unbearable economic situation, where one user had to maintain no less than 28 noninterchangeable tool shank configurations to operate their machining centers, supplied by the various machine tool builders. These 28 different tool shank configurations should be multiplied by the number of basic sizes to get an understanding of the resulting tool inventory problem.

A major user of machining centers decided to end this situation and developed a tool shank for machining centers. Several major machine tool builders, toolholder manufacturers, and users of machining centers were approached to discuss and confirm the need and practicality of their proposed design, and consider it as a basis for an American National Standard. A technical committee (TC 45) of American National Standards Committee (ANSC) B5, Group C, was delegated to study the proposed tool shank and prepare drafts for an American National Standard.

A standard was developed and published in November of 1978, as ANSI B5.50-1978. The technical committee followed the policy to establish new standards in SI units, and it was hoped that ISO would adopt a common worldwide metric standard.

After a number of meetings and recommendations, the ISO put forward a recommendation that would create more than one standard, which would lead to confusion by the addition of a number of national metric standards.

TC 45 of ANSC B5, Group C therefore recommended that the 1978 edition of the standard be revised and replaced with a new inch standard to reflect usage in this country.

This Standard specifies the dimensions of toolholder shanks, retention knobs, and sockets, and useful related technical information for machine tool spindles having 7/24 tapers intended for automatic tool changing.

Dimension *M* (Table 1) has been revised to allow for greater manufacturing flexibility.

Prior to this Standard, there were no applicable standards specifying dimensions and tolerances for tool sockets to match the tool shanks in ASME B5.50-1994.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers, Secretary, B5 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

This revision was approved as an American National Standard on March 31, 2009.

ASME B5 COMMITTEE
Machine Tools — Components, Elements, Performance, and Equipment

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by proposing revisions and attending Committee meetings. Correspondence should be addressed to:

Secretary, B5 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Request for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Attending Committee Meetings. The B5 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B5 Standards Committee.

7/24 TAPER TOOL TO SPINDLE CONNECTION FOR AUTOMATIC TOOL CHANGE

1 GENERAL

1.1 Scope

This Standard pertains to the standardization of basic toolholder shank, retention knob, and socket assemblies for numerically controlled machining centers with automatic tool changers. The requirements contained herein are intended to provide toolholder interchangeability between machining centers with automatic tool changers of various types. This Standard is the inch solution for basic toolholder shank, retention knob, and socket assemblies. This design specifies an interchangeable retention knob with a 45-deg clamping surface.

Section 2 of this Standard specifies the dimensions and tolerances of toolholder shanks having 7/24 tapers intended for automatic tool change. These are intended for use with the corresponding basic retention knob and spindle sockets specified in sections 3 and 4 (see Table 1).

Section 3 contains information for standardization of retention knobs for use with the 7/24 connection system described herein (see Table 2).

Section 4 specifies the dimensions and tolerances of spindle sockets, drive keys, and key seats for machine tool spindles having 7/24 tapers intended for automatic tool change (see Table 3 and Fig. 1). These are intended for use with the corresponding basic toolholder shank and retention knob specified in sections 2 and 3.

1.2 Noninterchangeability

Tool shanks conforming to ASME B5.18-1972 and ASME B5.40-1977 are not interchangeable with tool shanks established in this Standard. Tool shanks conforming to ISO 7388-1:1983 and retention knob ISO 7388-2:1984 types "A" and "B" are not interchangeable with this Standard. This also applies to additional shank and knob designs that are in the draft stages within the ISO standards development system. Accordingly, the reader should note the warning statement included with the retention knob specifications shown in Table 2.

Some incompatibility with existing automatic tool change arms may arise from dimension *M* (Table 1).

1.3 Classification

This Standard covers a basic toolholder shank with an "inch" threaded retention knob with 45-deg clamping surface that is applicable to general-purpose machining centers where loading and exchange of toolholders is accomplished by automatic means. The term *general purpose* is intended to differentiate between machine designs for unusually high accuracy requirements or designs intended to function with exceptionally high spindle rotational speeds coupled with higher axis feed rates, such as is normally found in high-speed machining. Tool shanks made to this Standard may be used with a variety of proprietary retention and/or flange locking systems.

1.4 Definitions

Terms relevant to this Standard and its application are as follows:

automatic tool changer (ATC): mechanism for the transfer of the toolholder between a storage feature and the spindle or nonrotating socket.

balance: when the mass centerline and rotational centerline of a rotor are coincident.

basic cone: geometrically ideal conical surface that is given by its geometrical dimensions. These are a basic cone diameter, the basic cone length, and the basic rate of taper, or the basic cone angle.

basic toolholder shank: unit that fits directly into the spindle or nonrotating socket of the machine and has provision for automatic tool change.

coolant hole: passage through the center of the retention knob that allows through-the-spindle coolant to pass. This hole also permits access to a tool set height adjustment screw if so equipped.

drive key: device intended to assist in delivery of the driving torque from the spindle nose to the tool.

effective case: depth within a metal part, measured from the part's surface, where the minimum required hardness is present.

retention knob: member of the toolholder retention system that provides a coupling point between the toolholder taper and the spindle drawbar.

spindle: component assembly of the machine tool, the function of which is to accept the basic toolholder shank.

spindle nose: the part of a spindle into which the tool shank is accepted.