# Errata
# to
# ASME B5.50-1994

The Errata corrections listed below apply to ASME B5.50-1994, "V" Flange Tool Shanks for Machining Centers With Automatic Tool Changers. This Errata to the 1994 edition is being issued in the form of replacement pages. Corrections are incorporated directly into the affected pages. Replace or insert the pages listed. It is also advisable that this cover page be retained for reference. The pages show the corrections given below. The pages not listed are the reverse sides of the listed pages and contain no changes.

| Page | Location | Change |
|---|---|---|
| v | Standards Committee Roster | Listing of Additional Contributors added by Errata |
| 6 | Table 2 | Bottom sketch corrected by Errata |

FEBRUARY 1995

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# ASME STANDARDS COMMITTEE B5
# 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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**H. Cooper,** *Chairman*
**P. D. Stumpf,** *Secretary*

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**D. L. Lewis,** Kennametal, Inc., Raleigh, North Carolina
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## TABLE 1 ESSENTIAL DIMENSIONS OF "V" FLANGE TOOL SHANKS

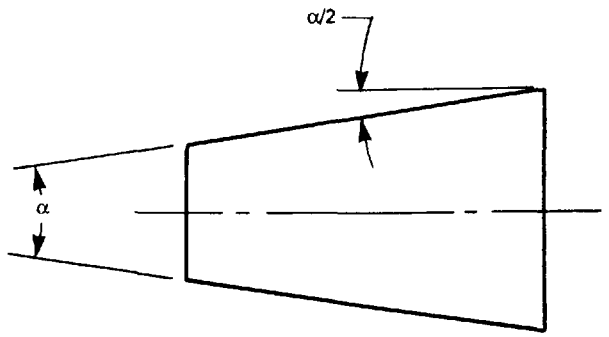
| Size / Tols. | $\phi A$ Gage Dia. | $B$ | $C$ | $D$ | $\phi E$ | $F$ | $\phi G$ | $\phi H$ | $J$ | $K$ | $L$ | $\phi M$ | $N$ | $P$ | $\phi R$ | $\phi S$ | $\phi T$ | $U$ | $\phi Z$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ±0.005 | ±0.010 | Min. | +0.015 −0.000 | UNC-28 | ±0.010 | ±0.002 | +0.000 −0.015 | +0.000 −0.015 | ±0.010 | ±0.005 | | Min. | ±0.002 | ±0.010 | Min. Flat | ±0.010 | +0.000 −0.005 |
| 30 | 1.250 | 1.875 | 0.188 | 1.00 | 0.516 | 0.500-13 | 1.531 | 1.812 | 0.735 | 0.640 | 0.645 | 1.250 | 0.015<br>0.030 | 1.38 | 2.176 | 0.590 | 0.650 | .030 | 1.250 |
| 40 | 1.750 | 2.687 | 0.188 | 1.12 | 0.641 | 0.625-11 | 2.219 | 2.500 | 0.985 | 0.890 | 0.645 | 1.750 | 0.045<br>0.060 | 1.38 | 2.863 | 0.720 | 0.860 | .030 | 1.750 |
| 45 | 2.250 | 3.250 | 0.188 | 1.50 | 0.766 | 0.750-10 | 2.969 | 3.250 | 1.235 | 1.140 | 0.770 | 2.250 | 0.075<br>0.090 | 1.38 | 3.613 | 0.850 | 1.090 | .030 | 2.250 |
| 50 | 2.750 | 4.000 | 0.250 | 1.75 | 1.031 | 1.000-8 | 3.594 | 3.875 | 1.485 | 1.390 | 1.020 | 2.750 | 0.075<br>0.090 | 1.38 | 4.238 | 1.125 | 1.380 | .030 | 2.750 |
| 60 | 4.250 | 6.375 | 0.312 | 2.25 | 1.281 | 1.250-7 | 5.219 | 5.500 | 2.235 | 2.140 | 1.020 | 4.250 | 0.120<br>0.200 | 1.50 | 5.683 | 1.375 | 2.040 | .040 | 4.250 |

GENERAL NOTES:
(a) Taper cone tolerance is in accordance with ISO-1947.
(△b) Standard cone angle tolerance grade is to be AT-4. See Table 2.
(c) Geometric dimension symbols are in accordance with ANSI Y14.5M-1982.
(d) Deburr all sharp edges.
(△e) All unspecified fillets and radii: R 0.03 +/− 0.010 or 0.03 +/− 0.010 × 45 deg.



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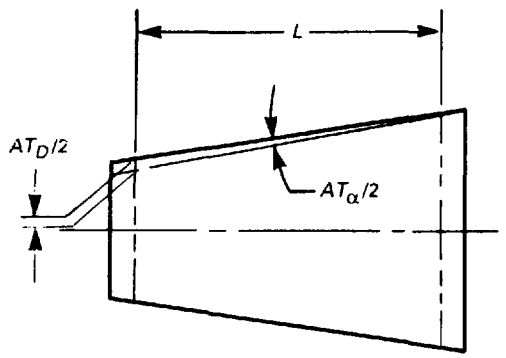
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## TABLE 2 ESSENTIAL DIMENSIONS OF CONE ANGLE TOLERANCES (Per ISO-1947)

| Taper size | α Basic | Tolerance Grade *AT*-4 | | | |
|---|---|---|---|---|---|
| | | Generating angle limits α/2 | | *AT* α/2 in Seconds of Arc | *AT* α/2 in μ radians |
| | | Min. | Max. | | |
| 30 | 16° 35′ 39.4″ | 8° 17′ 49.7″ | 8° 17′ 57.7″ | 8 | 40 |
| 40 | | 8° 17′ 49.7″ | 8° 17′ 56.2″ | 6.5 | 31.5 |
| 45 | | 8° 17′ 49.7″ | 8° 17′ 56.2″ | 6.5 | 31.5 |
| 50 | | 8° 17′ 49.7″ | 8° 17′ 54.7″ | 5 | 25 |
| 60 | | 8° 17′ 49.7″ | 8° 17′ 53.7″ | 4 | 20 |

GENERAL NOTES:
Tolerances are in the direction to only increase α or α/2.




$AT_\alpha$ is the angle tolerance

$AT_D$ is the calculated dimensional tolerance for length (*L*)

To establish gaging tolerances (eg. $AT_D/2$) over the length *L* use the following formula:

$AT_D/2$ (μm) = $AT\alpha/2$ (μ radians) × *L* (mm) × .001 (μm/mm) = ____μm

1 μm = .00004 in.

Example: If two gaging points on a 50 taper tool were 90 mm apart then $AT_D/2$ at *AT*-4 tolerancing level would equal:

$AT_D/2$ = 25 × 90 × .001 = 2.25 μm; 2.25 × .00004 = .00009 in.



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(REVISION OF ANSI/ASME B5.50-1985)

# "V" Flange Tool Shanks for Machining Centers With Automatic Tool Changers

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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AN AMERICAN NATIONAL STANDARD

# "V" Flange Tool Shanks for Machining Centers With Automatic Tool Changers

## ASME B5.50–1994

(REVISION OF ANSI /ASME B5.50–1985)

The American Society of Mechanical Engineers

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# FOREWORD

(This Foreword is not part of ASME B5.50-1994)

The Aerospace Industries Association (AIA) developed, in cooperation with machine tool builders and users, standards of tool holder shanks and retention knobs for machining centers with automatic tool changers. 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 tool holder 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 tool holder inventories. The AIA standard covered a series of straight and tapered shank tool holders, 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 his own, often proprietary and very ingenious, tool holder shank configurations for his 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 his 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, tool holder manufacturers, and users of machining centers were approached to discuss and confirm the need and practicality of his proposed design, and consider it as a basis for an American National Standard. A Technical Committee (TC 45) of ANSI B5, Group C, was delegated to study the proposed tool shank and prepare drafts for an ANSI 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 which would create more than one standard, which would lead to confusion by the addition of a number of national metric standards.

The TC 45 of ANSI B5, Group C, therefore recommended that the Standard B5.50-1978 be revised and replaced with a new Inch Standard to reflect usage in this country.

This Standard is intended to be a practical tool holder shank configuration to meet most of the requirements of industry using tool holders on machining centers with automatic tool changers. The revision was approved by the American National Standards Institute as an American National Standard on June 17, 1985.



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In the course of constant review by TC 45 of ASME B5, certain slight modifications were made to this Standard, as well as the 60 taper holders and corresponding retention knob being added to the main table, along with a "warning" note for the retention knobs. This revised Standard was approved by ANSI on April 5, 1994.



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# CONTENTS

Foreword ..... iii
Standards Committee Roster ..... v

1 Scope ..... 1
2 Definitions ..... 1
3 Precepts and Requirements ..... 2
4 Dimensional Requirements ..... 2

**Tables**
1 Essential Dimensions of "V" Flange Tool Shanks ..... 4
2 Essential Dimensions of Cone Angle Tolerances ..... 6
3 Essential Dimensions of Retention Knobs ..... 7



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# "V" FLANGE TOOL SHANKS FOR MACHINING CENTERS WITH AUTOMATIC TOOL CHANGERS

## 1 SCOPE

### 1.1 Purpose

This Standard pertains to the standardization of a basic tool holder shank and retention knob for numerically controlled machining centers with automatic tool changers. The requirements contained herein are intended to provide tool holder interchangeability between machining centers with automatic tool changers of various types. Dimensions for cone angle control are in accordance with the International Standard ISO-1947.

This Standard is the inch solution for a tool holder shank and retention knob assembly. This design specifies an interchangeable retention knob that utilizes a 45 deg. knob head angle to cooperate with a flexible retention device within the spindle.

The Technical Committee of ASME B5/TC 45 recognizes the ISO-7388/1-1983 Shank and the ISO-7388/2-1984 Type A Knob as the metric solution for tool holder shank and piloted retention knob assemblies.

### 1.2 Noninterchangeability

Tool shanks according to ANSI B5.18-1972 and ANSI B5.40-1968 are not interchangeable with tool shanks established in this Standard.

Tool shank assemblies according to the ISO-7388/1-1983 Shank and the ISO-7388/2 — types "A" and "B" Retention Knob specifications are not interchangeable with the ASME specification herein because of the piloted, metric threaded retention knob and the different knob head angle designs. This also applies to additional shank and knob designs that are in the draft stages within the ISO procedure. Accordingly, the reader should note the warning statement included with the retention knob specifications shown in Table 2.

### 1.3 Classification

This Standard covers a basic tool holder shank with an "inch" threaded retention knob with 45 deg. knob head angle that is applicable to general purpose machining centers where loading and exchange of tool holders 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 also permit use with certain front flange locking mechanisms.

## 2 DEFINITIONS

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

*spindle* — a component assembly of the machine tool, the function of which is to accept the basic tool holder shank

*nonrotating socket* — a receptacle that is fixed in regard to its mounting on the machine tool, the function of which is to accept the basic tool holder shank, locate, align and retain it. The nonrotating socket may be a feature of the storage facility.

*basic tool holder shank* — the unit that fits directly into the spindle of nonrotating socket of the machine and holds the tool or tool adapter

*tool* — a device retained by the tool holder base or tool adapter which contacts the workpiece for the purpose of material removal, marking, forming, etc.

*tool adapter* — the device which accepts the tool and fits into the basic tool holder having a basic tool holder shank. Its function is to center, establish angular position, provide for axial retention when re-



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quired, and drive the tool. Representative adaptive forms to receive the tool are collet, cylindrical bushing, screw thread, taper surface, etc.

*integral tool* — a tool which is integral with the basic tool holder shank

*tool setup* — a combination of a tool, basic tool holder shank, and necessary adapters to form a fixed unit to achieve the desired relationship between tool and spindle or nonrotating socket

*tool preset* — to assemble and fix the tool setup off-line to a preestablished length and diametric requirements

*positive drive* — the positive angular relationship between spindle or nonrotating socket and basic tool holder shank under full rated torque loading. This term and its provisions may also be applied to the mating features of the tool setup components.

*positive axial retention* — the retention of the basic tool holder shank in the spindle or nonrotating socket against the gaging and indexing provision with sufficient positive axial force to exceed the external cutting or work performance reactions

*retention knob* — a device for insertion into the end of the basic tool holder shank for positive retention

*tool angular orientation* — a mechanical feature to position and retain the basic tool holder shank in a specific angular relationship to the spindle or nonrotating socket

*automatic insertion and removal provision* — the basic tool holder shank has provisions for handling by an automatic tool changer mechanism for transfer between the storage feature and the spindle or nonrotating socket

*coolant flow through basic tool holder shank* — provision to permit the flow of coolant through the basic tool holder shank from the spindle or nonrotating socket to the tool in an amount and at a pressure to meet the specific requirements

*effective case* — the point at which 50 RC is reached when measuring the hardness of the carburized cross section

## 3 PRECEPTS AND REQUIREMENTS

The basic tool holder shank will meet the following functional requirements unless specified as optional.

*(a)* It may have provisions for off-line presetting of tool setup to controlled dimensions.

*(b)* It may have provisions to accept positive axial retention in the machine tool spindle or nonrotating socket.

*(c)* Overhang of the basic tool holder shank shall be held to practical minimum.

*(d)* It may have provision to accept positive drivers.

*(e)* It may have provision for automatic insertion and removal into the machine tool spindle or nonrotating socket.

*(f)* It may have provision for automatic angular orientation about the axis for the spindle or nonrotating socket of the machine tool.

*(g)* It may have provision for positive cutter orientation.

*(h)* In the application of tools which require orientation, it is recommended that the tool be in line and on the same side with the shallow orientation drive slot of the basic tool holder shank.

## 4 DIMENSIONAL REQUIREMENTS

*(a)* The dimensions of "V" flange taper shank series shall be per Table 1.

*(b)* The dimensions of the retention knob shall be per Table 2.



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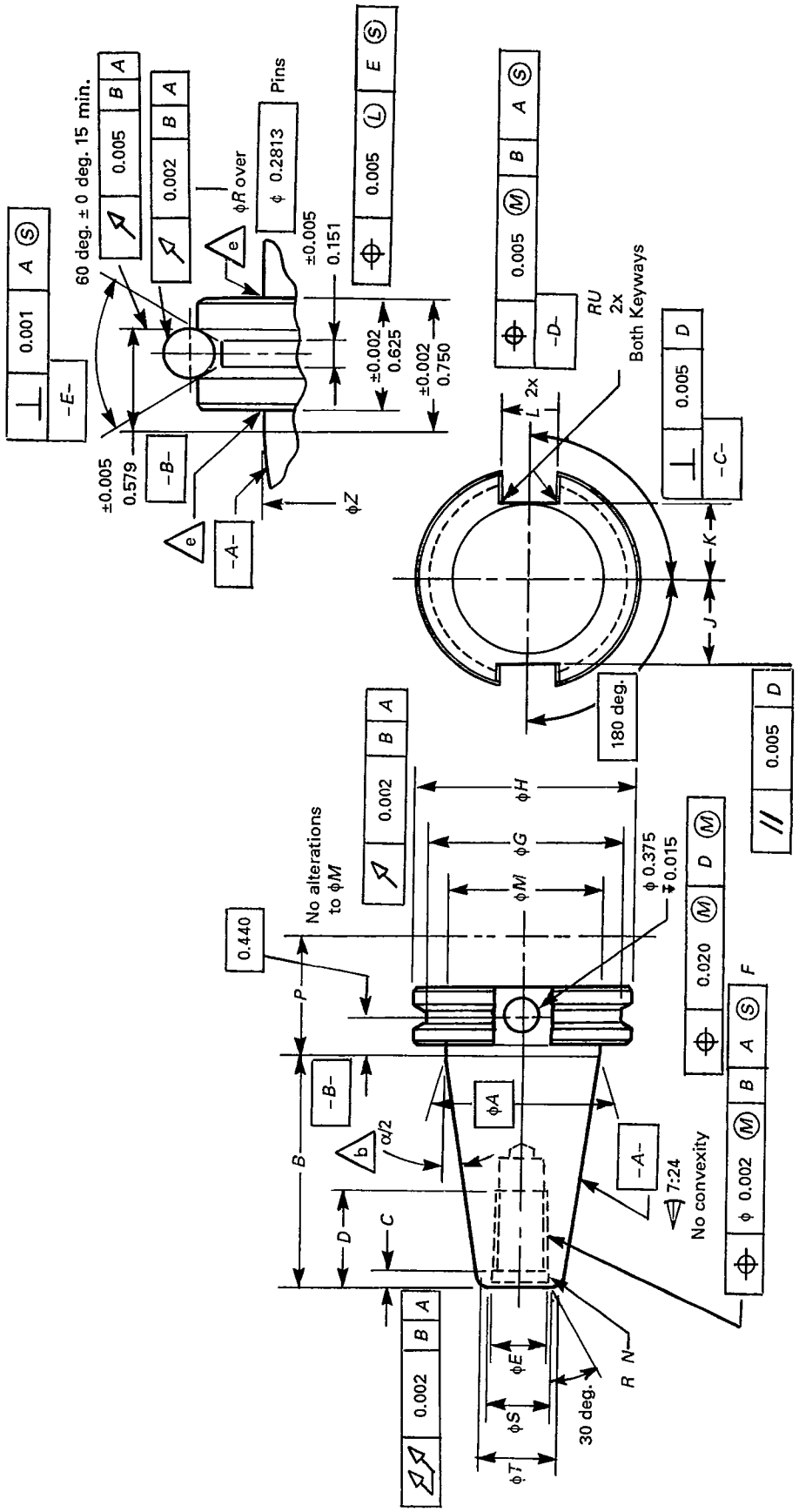
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(Table 1 begins on p. 4.)



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**TABLE 1 ESSENTIAL DIMENSIONS OF "V" FLANGE TOOL SHANKS**

| Size / Tols. | $\phi A$ Gage Dia. | $B$ ±0.005 | $C$ ±0.010 | $D$ Min. | $\phi E$ +0.015 −0.000 | $F$ UNC-28 | $\phi G$ ±0.010 | $\phi H$ ±0.002 | $J$ +0.000 −0.015 | $K$ +0.000 −0.015 | $L$ ±0.010 | $\phi M$ ±0.005 | $N$ | $P$ Min. | $\phi R$ ±0.002 | $\phi S$ ±0.010 | $\phi T$ Min. Flat | $U$ ±0.010 | $\phi Z$ +0.000 −0.005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 1.250 | 1.875 | 0.188 | 1.00 | 0.516 | 0.500-13 | 1.531 | 1.812 | 0.735 | 0.640 | 0.645 | 1.250 | 0.015<br>0.030 | 1.38 | 2.176 | 0.590 | 0.650 | .030 | 1.250 |
| 40 | 1.750 | 2.687 | 0.188 | 1.12 | 0.641 | 0.625-11 | 2.219 | 2.500 | 0.985 | 0.890 | 0.645 | 1.750 | 0.045<br>0.060 | 1.38 | 2.863 | 0.720 | 0.860 | .030 | 1.750 |
| 45 | 2.250 | 3.250 | 0.188 | 1.50 | 0.766 | 0.750-10 | 2.969 | 3.250 | 1.235 | 1.140 | 0.770 | 2.250 | 0.075<br>0.090 | 1.38 | 3.613 | 0.850 | 1.090 | .030 | 2.250 |
| 50 | 2.750 | 4.000 | 0.250 | 1.75 | 1.031 | 1.000-8 | 3.594 | 3.875 | 1.485 | 1.390 | 1.020 | 2.750 | 0.075<br>0.090 | 1.38 | 4.238 | 1.125 | 1.380 | .030 | 2.750 |
| 60 | 4.250 | 6.375 | 0.312 | 2.25 | 1.281 | 1.250-7 | 5.219 | 5.500 | 2.235 | 2.140 | 1.020 | 4.250 | 0.120<br>0.200 | 1.50 | 5.683 | 1.375 | 2.040 | .040 | 4.250 |

GENERAL NOTES:
(a) Taper cone tolerance is in accordance with ISO-1947.
(△) Standard cone angle tolerance grade is to be AT-4. See Table 2.
(c) Geometric dimension symbols are in accordance with ANSI Y14.5M-1982.
(d) Deburr all sharp edges.
(△) All unspecified fillets and radii: R 0.03 +/− 0.010 or 0.03 +/− 0.010 × 45 deg.



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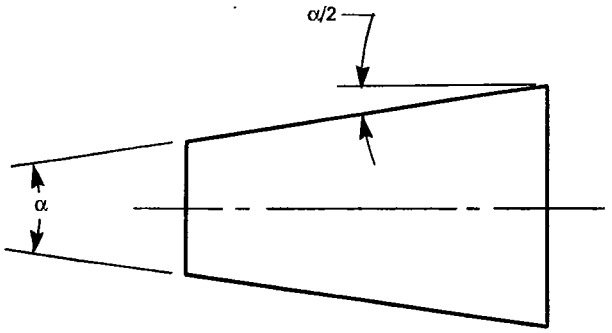
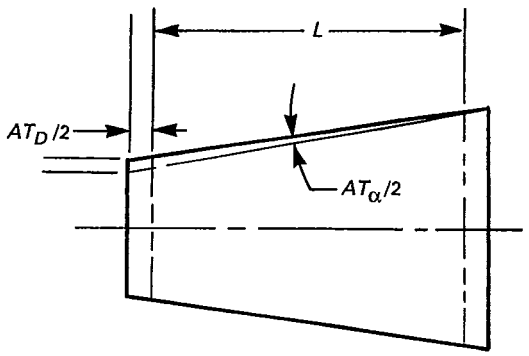



**TABLE 2 ESSENTIAL DIMENSIONS OF CONE ANGLE TOLERANCES (Per ISO-1947)**

| Taper size | α Basic | Tolerance Grade *AT*-4 | | | |
|---|---|---|---|---|---|
| | | Generating angle limits α/2 | | *AT* α/2 in Seconds of Arc | *AT* α/2 in μ radians |
| | | Min. | Max. | | |
| 30 | 16° 35′ 39.4″ | 8° 17′ 49.7″ | 8° 17′ 57.7″ | 8 | 40 |
| 40 | | 8° 17′ 49.7″ | 8° 17′ 56.2″ | 6.5 | 31.5 |
| 45 | | 8° 17′ 49.7″ | 8° 17′ 56.2″ | 6.5 | 31.5 |
| 50 | | 8° 17′ 49.7″ | 8° 17′ 54.7″ | 5 | 25 |
| 60 | | 8° 17′ 49.7″ | 8° 17′ 53.7″ | 4 | 20 |

GENERAL NOTES:
Tolerances are in the direction to only increase α or α/2.




$AT_\alpha$ is the angle tolerance

$AT_D$ is the calculated dimensional tolerance for length (*L*)

To establish gaging tolerances (eg. $AT_D/2$) over the length *L* use the following formula:

$AT_D/2$ (μm) = $AT\alpha/2$ (μ radians) × *L* (mm) × .001 (μm/mm) = ____μm

1 μm = .00004 in.

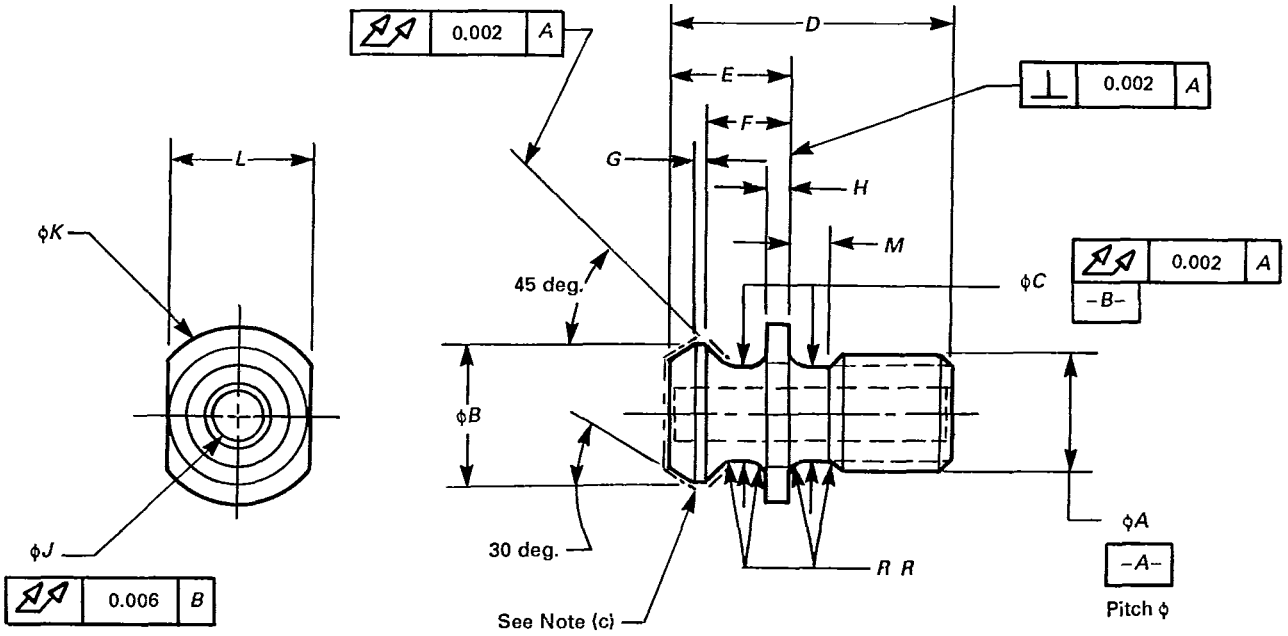
Example: If two gaging points on a 50 taper tool were 90 mm apart then $AT_D/2$ at *AT*-4 tolerancing level would equal:

$AT_D/2$ = 25 × 90 × .001 = 2.25 μm; 2.25 × .00004 = .00009 in.



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## TABLE 3 ESSENTIAL DIMENSIONS OF RETENTION KNOBS

| Size \ Tols. | A | B | C | D | E | F | G | H | J | K | L | M | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | UNC-2A | ±0.005 | ±0.005 | ±0.040 | ±0.005 | ±0.005 | ±0.010 | ±0.010 | ±0.010 | | +0.000 −0.010 | ±0.040 | +0.010 −0.005 |
| 30 | 0.500-13 | 0.520 | 0.385 | 1.10 | 0.460 | 0.320 | 0.04 | 0.10 | 0.187 | 0.65<br>0.64 | 0.53 | 0.19 | 0.094 |
| 40 | 0.625-11 | 0.740 | 0.490 | 1.50 | 0.640 | 0.440 | 0.06 | 0.12 | 0.281 | 0.94<br>0.92 | 0.75 | 0.22 | 0.094 |
| 45 | 0.750-10 | 0.940 | 0.605 | 1.80 | 0.820 | 0.580 | 0.08 | 0.16 | 0.375 | 1.20<br>1.18 | 1.00 | 0.22 | 0.094 |
| 50 | 1.000-8 | 1.140 | 0.820 | 2.30 | 1.000 | 0.700 | 0.10 | 0.20 | 0.468 | 1.44<br>1.42 | 1.25 | 0.25 | 0.125 |
| 60 | 1.250-7 | 1.460 | 1.045 | 3.20 | 1.500 | 1.080 | 0.14 | 0.30 | 0.500 | 2.14<br>2.06 | 1.50 | 0.31 | 0.125 |

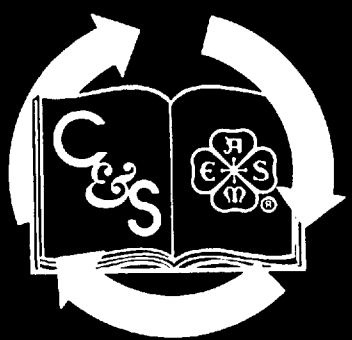
GENERAL NOTES:
(*a*) Material: low carbon alloy steel.
(*b*) Heat treatment: carburize and harden to 0.016 to 0.028 in. effective case.
(*c*) Hardness to be RC 56-60 on surfaces indicated by a chain dotted line: core hardness RC 35-45.
(*d*) *J* hole shall not be carburized.
(*e*) *C* and *R* must be free of tool marks.
(*f*) Deburr all sharp edges.
(*g*) Geometric dimension symbols are in accordance with ANSI YI4.5M-1982.

WARNING:
Retention knobs are available in various styles, and are not necessarily interchangeable. At all times, the proper retention knob should be used with the appropriate adapter, according to machine specifications. Failure to use the correct retention knob, or to inadequately tighten the retention knob, may result in the adapter coming loose. The result is a potential for personal injury. Obviously, the metric and inch threaded retention knobs are not interchangeable. The use of a combination of metric and nonmetric components can result in inadequate coupling of the adapter to the spindle during machining, and a failure of the components.



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ASME B5.50 94 ■ 0759670 0541379 3T5 ■



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ISBN #0-7918-2286-9

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