

AN AMERICAN NATIONAL STANDARD

# Gages and Gaging for Unified Inch Screw Threads

---

ANSI/ASME B1.2-1983

(REVISION OF ANSI B1.2-1974)

**REAFFIRMED 1991**

FOR CURRENT COMMITTEE PERSONNEL

PLEASE SEE ASME MANUAL AS-11

*SPONSORED AND PUBLISHED BY*

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center

345 East 47th Street

New York, N. Y. 10017

## ACCEPTANCE NOTICE

The above non-Government document was adopted on 5 March 1985 and is approved for use by the Federal agencies. The indicated industry group has furnished the clearance required by existing regulations. Copies of the document are stocked by the DoD Single Stock Point, Naval Publications and Forms Center, Philadelphia, PA 19120, for issue to DoD activities only. Contractors and industry groups must obtain copies directly from:

The American Society of Mechanical Engineers  
United Engineering Center, 345 E. 47th Street  
New York, NY 10017

or

The American National Standards Institute,  
1430 Broadway, New York, NY 10018

Title of Document: Gages and Gaging for Unified Inch Screw Threads

Date of Specific Issue Adopted: 16 May 1983

Releasing Industry Group: The American Society of Mechanical Engineers

NOTE: See FED-STD-H28/6: Screw-Thread Standards for Federal Services, Section 6, Gages and Gaging for Unified Screw Threads – UN and UNR Thread Forms

NOTICE: When reaffirmation, amendment, revision, or cancellation of this standard is initially proposed, the industry group responsible for this Standard shall inform the military coordinating activity of the proposed change and request their participation.

Custodians: Army – AR; Navy – AS; Air Force – 11

Review Activities: Army – AT, AV, GL, ME

User Activities: Navy – EC

Civil Agency Coordinating Activities: Commerce – NBS

DOE – ACO, APM, FAA, FRA, NHT

GSA – FSS, PCD; HUD – HCC; Justice – FPI

NASA – JFK, LRC, MSF; USDA – AFS

Military Coordinating Activity: DLA – IS

(Project THDS-0045)

AREA-THDS
-----------

AN AMERICAN NATIONAL STANDARD

# Gages and Gaging for Unified Inch Screw Threads

---

ANSI/ASME B1.2-1983

(REVISION OF ANSI B1.2-1974)

*SPONSORED AND PUBLISHED BY*

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center      345 East 47th Street      New York, N. Y. 10017

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.

Date of Issuance: June 15, 1984

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Consensus Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment which provides an opportunity for additional public input from industry, academia, regulatory agencies, and in the public-at-large.

ASME does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable Letters Patent, nor assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME does not accept any responsibility for interpretations of this document made by individual volunteers.

No part of this document may be reproduced in any form,  
in an electronic retrieval system or otherwise,  
without the prior written permission of the publisher.

Copyright © 1984 by  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
All Rights Reserved  
Printed in U.S.A.

## FOREWORD

(This Foreword is not part of American National Standard ANSI/ASME B1.2-1983,  
Gages and Gaging for Unified Inch Screw Threads.)

American National Standards Committee B1 for the Standardization of screw threads was organized in 1920 as Sectional Committee B1 under the aegis of the American Engineering Standards Committee (later the American National Standards Association, then the United States of America Standards Institute and, as of October 6, 1969, the American National Standards Institute, Inc.), with the Society of Automotive Engineers and the American Society of Mechanical Engineers as joint sponsors.

In 1982, American National Standards Committee B1 was reorganized as the ASME Standards Committee B1, and since then it has operated under the American Society of Mechanical Engineers Procedures to produce and update standards which may become ANSI Standards after final approval by the American National Standards Institute.

A declaration of accord with respect to the unification of screw threads was signed on November 18, 1948, by representatives of the services and industry of the United States, the United Kingdom, and Canada. The ANSI Unified Screw Thread Standard B1.1, through the quadripartite standardization agreement (QST AG) 247, Unified Threads, is subject to an international standardization agreement through the instrumentality of the American-British-Canadian-Australian Army Standardization Program, which recognizes B1.1 as a standard for Unified Threads when it is required to effect the interchangeability of parts and equipment between the armies of the participating nations.

The first American National Standard for Screw Thread Gages and Gaging was published as ASA B1.2-1941 to supplement the parent Standard ASA B1.1-1935, Screw Threads for Bolts, Nuts, Machine Screws and Threaded Parts. That Standard was revised and republished as a Unified Standard ASA B1.1-1949 and again as ASA B1.1-1960. The Unified Gage Standard was republished as ASA B1.2-1951 and USA B1.2-1966.

On February 9, 1973, a meeting was held by the Department of Commerce at the National Bureau of Standards, Washington, D.C., attended by representatives of government and industry screw thread interests. With the goal of eliminating parallel standards, those at the meeting recommended that the NBS Handbook H-28 be converted into a coordinating document for government screw thread standards wherein sections of H-28 would be replaced by single page references to existing industry standards. It was further recommended that the chairman of American National Standards Committee B1 set up a group to clearly define and establish identified levels of acceptability for screw threads.

At an American National Standards Committee B1 meeting held on May 3, 1973, unanimous approval was given to the following motion: "The B1 Committee recognizing the needs of industry for different levels of acceptability for screw threads, establishes new scopes for Standards B1.1 and B1.2 and sets up a new standard, B1.3." References to conformance criteria were removed from ANSI B1.2-1974 and additional gages and gaging data were added to suit additional conformance requirements specified in ANSI B1.3 or other B1 thread documents.

This new publication, designated ANSI/ASME B1.2-1983, has had considerable new material added to cover the many options of gages and measuring equipment shown in ANSI B1.3, Screw Thread Gaging Systems for Dimensional Acceptability. It has also re-

applied HI and LO to function as NOT GO gages and has eliminated gages with pitch diameter outside product thread limits. ANSI B1.2 was approved by the ASME Standards Committee B1 on March 18, 1983.

The proposed standard was submitted by the ASME Board of Standardization to the American National Standards Institute. It was approved and formally designated an American National Standard on May 16, 1983.

## ASME STANDARDS COMMITTEE B1 Standardization and Unification of Screw Threads

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

### OFFICERS

**D. J. Emanuelli**, *Chairman*      **H. W. Ellison**, *Vice Chairman*  
**C. E. Lynch**, *Secretary*

### COMMITTEE PERSONNEL

#### AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

**G. G. Gerber**, McDonnell Douglas, St. Louis, Missouri  
**H. Borrmann**, *Alternate*, Sperry Gyroscope Division, Great Neck, New York

#### AMERICAN IRON AND STEEL INSTITUTE

**F. Dallas, Jr.**, Sawhill Tubular Division, Sharon, Pennsylvania

#### AMERICAN MEASURING TOOL MANUFACTURERS ASSOCIATION

**D. Dodge**, Penney-Dodge Company, Glendale, California  
**C. W. Jatho**, *Alternate*, American Measuring Tool Manufacturers Association, Birmingham, Michigan

#### AMERICAN PIPE FITTINGS ASSOCIATION

**W. C. Farrell**, Stockham Valves and Fittings, Birmingham, Alabama

#### DEFENSE INDUSTRIAL SUPPLY CENTER

**E. Schwartz**, Defense Industrial Supply Center, Philadelphia, Pennsylvania  
**F. S. Ciccarone**, *Alternate*, Defense Industrial Supply Center, Philadelphia, Pennsylvania

#### ENGINE MANUFACTURERS ASSOCIATION

**G. A. Russ**, Cummins Engine Company, Columbus, Indiana

#### FARM AND INDUSTRIAL EQUIPMENT INSTITUTE

**J. F. Nagy**, Ford Motor Company, Dearborn, Michigan

#### INDUSTRIAL FASTENERS INSTITUTE

**R. B. Belford**, Industrial Fasteners Institute, Cleveland, Ohio  
**R. M. Harris**, Bethlehem Steel Company, Lebanon, Pennsylvania  
**K. E. McCullough**, SPS Technologies, Inc., Jenkintown, Pennsylvania  
**J. C. McMurray**, Russell, Burdsall and Ward Inc., Mentor, Ohio  
**J. A. Trilling**, Holo-Krome Company, West Hartford, Connecticut  
**E. D. Spengler**, *Alternate*, Bethlehem Steel Company, Lebanon, Pennsylvania

#### MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTING INDUSTRY

**W. C. Farrell**, Stockham Valves and Fitting, Birmingham, Alabama

#### METAL CUTTING TOOL INSTITUTE (TAP AND DIE DIVISION)

**N. F. Nau**, Union/Butterfield, Athol, Massachusetts  
**A. D. Shepherd, Jr.**, *Alternate*, Union/Butterfield, Derby Line, Vermont

#### NATIONAL AUTOMATIC SPRINKLER AND FIRE CONTROL ASSOCIATION, INC.

**W. Testa**, Grinnell Fire Protection Systems Company, Inc., Providence, Rhode Island  
**R. P. Fleming**, *Alternate*, National Automatic Sprinkler and Fire Control Association, Inc., Patterson, New York

**NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION**

**J. L. Griffin**, Wheatland Tube Company, Wheatland, Pennsylvania  
**J. B. Levy**, General Electric Company, Schenectady, New York  
**F. F. Weingruber**, Westinghouse Electric Corp., Pittsburgh, Pennsylvania  
**W. R. Williford**, *Alternate*, National Electrical Manufacturers Association, Washington, D.C.

**NATIONAL MACHINE TOOL BUILDERS ASSOCIATION**

**R. J. Sabatos**, The Cleveland Twist Drill Company, Cleveland, Ohio  
**D. R. Stoner, Jr.**, Teledyne Landis Machine, Waynesboro, Pennsylvania

**NATIONAL SCREW MACHINE PRODUCTS ASSOCIATION**

**T. S. Meyer**, Fischer Special Manufacturing Company, Cold Spring, Kentucky  
**H. A. Eichstaedt**, *Alternate*, National Screw Machine Products Association, Brecksville, Ohio

**SOCIETY OF AUTOMOTIVE ENGINEERS**

**H. W. Ellison**, General Motors Technical Center, Warren, Michigan

**SOCIETY OF MANUFACTURING ENGINEERS**

**D. Davidson**, Morse/Hemco Corporation, Holland, Michigan

**TUBULAR RIVET AND MACHINE INSTITUTE**

**R. M. Byrne**, Industry Service Bureaus, Inc., White Plains, New York

**U.S. DEPARTMENT OF THE AIR FORCE**

**R. P. Stewart**, Wright-Patterson, Ohio

**U.S. DEPARTMENT OF THE ARMY**

**F. J. Clas**, U.S. Department of the Army, Watervliet, New York  
**J. Crowley**, U.S. Army Material Development and Readiness Command, Alexandria, Virginia  
**F. L. Jones**, *Alternate*, U.S. Army Missile Command, Redstone Arsenal, Alabama

**U.S. DEPARTMENT OF DEFENSE**

**E. Schwartz**, Defense Industrial Supply Center, Philadelphia, Pennsylvania

**U. S. DEPARTMENT OF THE NAVY**

**C. T. Gustafson**, Portsmouth Naval Shipyard, Portsmouth, New Hampshire

**INDIVIDUAL MEMBERS**

**C. T. Appleton**, Jefferson, Massachusetts  
**J. Boehnlein**, PMC Industries, Wickliffe, Ohio  
**R. Browning**, Southern Gage Company, Erin, Tennessee  
**R. S. Chamerda**, The Johnson Gage Company, Bloomfield, Connecticut  
**J. F. Cramer**, Des Moines, Washington  
**E. W. Drescher**, Lancaster, Pennsylvania  
**D. J. Emanuelli**, Greenfield Tap and Die, Greenfield, Massachusetts  
**C. G. Erickson**, Colt Industries — Sterling Die Operation, West Hartford, Connecticut  
**S. I. Kanter**, P.E., The Hanson-Whitney Company, Hartford, Connecticut  
**R. W. Lampion**, The Van Keuren Company, Watertown, Massachusetts  
**A. R. Machell, Jr.**, Xerox Corp., Rochester, New York  
**A. E. Masterson**, Watervliet, New York  
**R. E. Mazzara**, Geometric Tool, New Haven, Connecticut  
**P. V. Pastore**, Regal Beloit Corp., South Beloit, Illinois  
**M. M. Schuster**, Hi-Shear Corporation, Torrance, California  
**A. G. Strang**, Boyds, Maryland  
**A. F. Thibodeau**, Swanson Tool Manufacturing, Inc., West Hartford, Connecticut  
**J. W. Turton**, The Bendix Corp., Greenfield, Massachusetts

**Subcommittee B1.2 — Screw Thread Gages and Gaging**

**R. Browning**, *Chairman*, Southern Gage Company, Erin, Tennessee  
**A. F. Thibodeau**, *Secretary*, Swanson Tool Manufacturing, Inc., West Hartford, Connecticut  
**P. F. Bitters**, Greenfield Tap and Die, Greenfield, Massachusetts  
**J. Boehnlein**, PMC Industries, Wickliffe, Ohio

D. **Cadieux**, Greenfield Tap and Die, Greenfield, Massachusetts  
R. **S. Chamerda**, The Johnson Gage Company, Bloomfield, Connecticut  
M. **Davidson**, Morse/Hemco Corp., Holland, Michigan  
D. **Dodge**, Pennoyer-Dodge Company, Glendale, California  
H. **W. Ellison**, General Motors Technical Center, Warren, Michigan  
J. **J. Fiscella**, Latham, New York  
G. **Garcina**, Indianapolis, Indiana  
C. **T. Gustafson**, Metrology Laboratories Division, Portsmouth, New Hampshire  
S. **I. Kanter**, The Hanson-Whitney Company, Hartford, Connecticut  
R. **W. Lampport**, The Van Keuren Company, Watertown, Massachusetts  
A. **E. Masterson**, Watervliet, New York  
K. **E. McCullough**, SPS Technologies, Inc., Jenkintown, Pennsylvania  
J. **C. McMurray**, Russell, Burdsall and Ward, Inc., Mentor, Ohio  
J. **Preziosi**, Amerace-Esna Corp., Union, New Jersey  
M. **M. Schuster**, Hi-Shear Corp., Torrance, California  
E. **Schwartz**, Defense Industrial Supply Center, Philadelphia, Pennsylvania  
A. **G. Strang**, Boyds, Maryland  
J. **W. Turton**, The Bendix Corp., Greenfield, Massachusetts  
A. **Zaverucha**, McMellon Brothers, Stratford, Connecticut

### **Task Group B1.16 — Gages and Gaging for Metric M Screw Threads**

C. **G. Erickson**, *Chairman*, West Hartford, Connecticut  
R. **Browning**, *Secretary*, Southern Gage Company, Erin, Tennessee  
R. **S. Chamerda**, The Johnson Gage Company, Bloomfield, Connecticut  
M. **Davidson**, H. E. Morse Company, Holland, Michigan  
D. **Emanuelli**, Greenfield Tap and Die, Greenfield, Massachusetts  
S. **I. Kanter**, The Hanson-Whitney Company, Hartford, Connecticut  
R. **W. Lampport**, The Van Keuren Company, Watertown, Massachusetts  
K. **E. McCullough**, SPS Technologies, Inc., Jenkintown, Pennsylvania  
J. **C. McMurray**, Russell, Burdsall, and Ward, Inc., Mentor, Ohio  
E. **Schwartz**, Defense Industrial Supply Center, Philadelphia, Pennsylvania  
A. **G. Strang**, Boyds, Maryland

Intentionally left blank

## CONTENTS

Foreword .....		iii
Standards Committee Roster .....		v
<b>1 Introduction</b> .....		<b>1</b>
1.1 References .....		1
1.2 Classification .....		1
1.3 Federal Government Use .....		1
<b>2 Basic Principles</b> .....		<b>1</b>
2.1 Accuracy in Gaging .....		1
2.2 Limitations of Gaging .....		1
2.3 Determining Size of Gages .....		10
2.4 Standard Temperature .....		10
<b>3 General Practice</b> .....		<b>10</b>
3.1 General Design .....		10
3.2 Types of Gages .....		10
3.3 Interpretation of Tolerances .....		10
3.4 Direction of Tolerances on Gages .....		10
3.5 Standard Thread Gage Tolerances .....		11
3.6 Tolerance on Lead .....		11
3.7 Tolerances on Half-Angle .....		11
3.8 Check of Effect of Lead and Flank Angle Variations on Product Thread .....		11
3.9 Calibration Requirements and Standards .....		11
<b>4 Types of Gages for Product Internal Thread</b> .....		<b>11</b>
4.1 GO Working Thread Plug Gages .....		11
4.2 NOT GO (HI) Thread Plug Gages .....		13
4.3 Thread Snap Gages — GO Segments or Rolls .....		14
4.4 Thread Snap Gages — NOT GO (HI) Segments or Rolls .....		20
4.5 Thread Snap Gages — Minimum Material: Pitch Diameter Cone and Vee .....		20
4.6 Thread Snap Gages — Minimum Material: Thread Groove Diameter Type .....		23
4.7 Thread-Setting Solid Ring Gages .....		24
4.8 Plain Plug, Snap, and Indicating Gages to Check Minor Diameter of Internal Thread .....		24
4.9 Snap and Indicating Gages to Check Major Diameter of Internal Thread .....		28
4.10 Functional Indicating Thread Gages for Internal Thread .....		28
4.11 Minimum-Material Indicating Thread Gages for Internal Thread .....		33
4.12 Indicating Runout Thread Gage for Internal Thread .....		33
4.13 Differential Gaging .....		37

4.14	Pitch Micrometers .....	39
4.15	Thread-Measuring Balls .....	39
4.16	Optical Comparator and Toolmaker's Microscope .....	39
4.17	Profile Tracing Instrument .....	40
4.18	Surface Roughness Equipment .....	40
4.19	Roundness Equipment .....	40
4.20	Miscellaneous Gages and Gaging Equipment .....	40
<b>5</b>	<b>Types of Gages for Product External Thread .....</b>	<b>40</b>
5.1	GO Working Thread Ring Gages .....	40
5.2	NOT GO (LO) Thread Ring Gages .....	128
5.3	Thread Snap Gages — GO Segments or Rolls .....	129
5.4	Thread Snap Gages — NOT GO (LO) Segments or Rolls .....	131
5.5	Thread Snap Gages — Cone and Vee .....	133
5.6	Thread Snap Gages — Minimum Material: Thread Groove Diameter Type .....	133
5.7	Plain Ring and Snap Gages to Check Major Diameter of Product External Threads .....	133
5.8	Snap Gages for Minor Diameter of Product External Threads .....	135
5.9	Functional Indicating Thread Gages for External Thread .....	135
5.10	Minimum-Material Indicating Thread Gages for External Thread .....	139
5.11	Indicating Runout Gage for External Threads .....	139
5.12	Differential Gaging .....	139
5.13	W Tolerance Thread-Setting Plug Gages .....	143
5.14	Plain Check Plug Gages for Thread Ring Gages .....	148
5.15	Indicating Plain Diameter Gages — Major Diameter of Product External Threads .....	148
5.16	Indicating Gages to Check Minor Diameter of External Thread .....	148
5.17	Thread Micrometers .....	159
5.18	Thread-Measuring Wires .....	159
5.19	Optical Comparator and Toolmaker's Microscope .....	159
5.20	Profile Tracing Instrument .....	160
5.21	Electromechanical Lead Tester .....	160
5.22	Helical Path Attachment Used With GO Type Thread Indicating Gage .....	160
5.23	Helical Path Analyzer .....	160
5.24	Surface Roughness Equipment .....	161
5.25	Roundness Equipment .....	161
5.26	Miscellaneous Gages and Gaging Equipment .....	161

## Figures

1	Maximum-Material GO Functional Limit .....	12
2	Partial End Threads and Chip Grooves .....	14
3	NOT GO (HI) Functional Diameter Limit .....	16
4	Thread Snap Gages — Maximum-Material GO Functional Limit .....	19
5	Thread Snap Gages — NOT GO (HI) Functional Diameter Limit .....	21
6	Thread Snap Gages — Minimum-Material Pitch Diameter Limit — Cone and Vee .....	22
7	Thread Snap Gages — Minimum-Material Thread Groove Diameter Limit .....	23
8	Thread Form of Solid Thread-Setting Ring Gages .....	26
9	Minor Diameter Limit — Cylindrical Plug Gages .....	27
10	Indicating Plain Diameter Gages — Max.-Min. Minor Diameter Limit and Size .....	29
11	Snap and Indicating Diameter Gages — Max.-Min. Major Diameter Limit and Size .....	30

12	Indicating Thread Gages — Maximum-Material GO Functional Limit and Size .....	31
13	Indicating Thread Gages — Minimum-Material Pitch Diameter Limit and Size — Cone and Vee .....	34
14	Indicating Thread Gages — Minimum-Material Pitch Diameter Limit and Size — Ball and Radius .....	35
15	Indicating Thread Gages — Diameter Runout — Minor to Pitch .....	36
16	Indicating Thread Gages — Differential Gaging .....	38
17	Inside Micrometer, Caliper Type .....	39
18	Maximum-Material GO Functional Limit .....	127
19	NOT GO (LO) Functional Diameter Limit .....	129
20	Thread Snap Gages — Maximum-Material GO Functional Limit .....	130
21	Thread Snap Gages — NOT GO (LO) Functional Diameter Limit .....	132
22	Thread Snap Gages — Minimum-Material Pitch Diameter Limit — Cone and Vee .....	134
23	Thread Snap Gages — Minimum-Material Thread Groove Diameter Limit .....	135
24	Major Diameter Limit .....	136
25	Minor Diameter Limit Snap Type .....	137
26	Indicating Thread Gages — Maximum-Material GO Functional Diameter Limit and Size .....	138
27	Indicating Thread Gages — Minimum-Material Pitch Diameter Limit and Size — Cone and Vee .....	140
28	Indicating Thread Gages — Minimum-Material Thread Groove Diameter Limit and Size .....	141
29	Indicating Thread Gages — Diameter Runout — Major to Pitch .....	142
30	Indicating Thread Gages — Differential Gaging .....	144
31	Thread Form of Truncated Thread-Setting Plug Gages .....	146
32	Thread Form of Full-Form Thread-Setting Plug Gages .....	147
33	Indicating Plain Diameter Gage — Max.-Min. Major Diameter Limit and Size .....	149
34	Indicating Diameter Gages — Max.-Min. Minor Diameter Limit and Size .....	150
35	Indicating Gages — Helical Path Attachment Used With GO Type Indicating Gage .....	160

## Tables

1	Screw Thread Gages and Measuring Equipment for External Product Thread Characteristics .....	2
2	Screw Thread Gages and Measuring Equipment for Internal Product Thread Characteristics .....	6
3	Recommended Widths for Chip Grooves .....	13
4	Specifications and Format for Tables 10 and 11 — Limits of Size of Threaded and Plain Gages for Unified External and Internal Threads .....	15
5	Specifications and Format for Tables 10 and 11 — Limits of Size of Thread- Setting Gages for Unified Thread Working Gages .....	17
6	X Gage Tolerances for Thread Gages .....	18
7	W Gage Tolerances for Thread Gages .....	25
8	Gage Tolerances for Plain Cylindrical Gages .....	28
9	Constants for Computing Thread Gage Dimensions .....	32
10	Gages for Standard Thread Series, Classes 1A, 2A, 3A, 1B, 2B, and 3B Unified Screw Threads — Limits of Size .....	41
11	Setting Gages for Standard Thread Series, Classes 1A, 2A, 3A, 1B, 2B, and 3B Unified Screw Threads — Limits of Size .....	83
12	Calibration Requirements and Standards for X Tolerance Thread Gages, Indicating Gages, Plain Gages, and Measuring Equipment for External Product Threads .....	151

13	Calibration Requirements and Standards for X Tolerance Thread Gages, Indicating Gages, Plain Gages, and Measuring Equipment for Internal Product Threads .....	155
14	Calibration Requirements for Thread- and Plain-Setting Gages .....	159

**Appendices**

<b>A</b>	<b>Calibration and Inspection of Limit Gages, Snap Gages, Indicating Gages, and Measuring Instruments</b>	
A1	General .....	163
A2	Thread Plug Gage Calibration .....	163
A3	Thread Ring Gage Inspection .....	164
A4	Plain Plug Gage Calibration .....	167
A5	Plain Ring Gage Calibration .....	168
A6	Plain Snap Gages .....	168
A7	Rolls With Zero Lead Thread Form Used on Snap and Indicating Gages .....	168
A8	Inspecting Peripheral Contacting Segments Used on External Product Thread .....	168
A9	Inspection of Thread Contact Segments Used on Internal Product Thread .....	170
A10	Check for Magnification Discrepancies Due to Indicating System Linkage .....	170
A11	Calibration of Dial and Electronic Indicators .....	170
A12	Assessment of Surface Quality .....	171
<b>B</b>	<b>Metrology of 60 deg. Screw Threads</b> .....	173
B1	Wire Method of Measurement of Pitch Diameter (Thread Groove Diameter) .....	173
B2	Size of Wires .....	173
B3	Methods of Measuring Wires Considering the Effect of Deformation .....	173
B4	Methods of Measurement Using Wires .....	176
B5	Standard Specification for Wires and Standard Practice in Measurement of Wires of 60 deg. Threads .....	176
B6	General Formula for Measurement of Pitch Diameter .....	177
B7	Simplified Formula for Pitch Diameter .....	177
B8	Setting Measuring Instruments With Variable Measuring Force .....	178
B9	Thread Balls .....	178
B10	Internal Pitch Diameter Measurement .....	179

**Figure**

B1	A Three-Wire Method of Measuring Pitch (Thread Groove) Diameter of Thread Plug Gages .....	174
----	--	-----

**Tables**

A1	Minimum Magnification .....	164
A2	60 deg. Included Thread Angle .....	165
A3	Lengths of AGD Taperlock and Trilock Thread Plug Gage Blanks Selected From ANSI B47.1 .....	166
A4	Lengths of AGD Thread Ring Gage Blanks and Total Thread Lengths of Standard Truncated-Setting Plug Gage Blanks Selected from ANSI B47.1 .....	169
B1	Thread-Measuring Wires for 60 deg. Screw Threads .....	175
B2	Measuring Force for Over-Wire Measurements of External Pitch Diameter and Wire Calibration, and Cylindrical Diameter for Wire Calibration .....	176
B3	Measuring Force Over Balls for Internal Pitch Diameter Measurement and Ball Calibration .....	179

AN AMERICAN NATIONAL STANDARD

## GAGES AND GAGING FOR UNIFIED INCH SCREW THREADS

### 1 INTRODUCTION

This Standard provides essential specifications and dimensions for the gages used on Unified inch screw threads (UN and UNR thread form), and covers the specifications and dimensions for the thread gages and measuring equipment listed in Tables 1 and 2. The basic purpose and use of each gage are also described.

#### 1.1 References

The latest editions of the following documents form a part of this Standard, to the extent specified herein.

##### *American National Standards*

ANSI B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B1.3	Screw Thread Gaging Systems for Dimensional Acceptability
ANSI B1.7	Nomenclature, Definitions, and Letter Symbols for Screw Threads
ANSI B46.1	Surface Texture: Surface Roughness, Waviness, and Lay
ANSI B47.1	Gage Blanks
ANSI B89.1.6	Measurement of Qualified Plain Internal Diameters for Use as Master Rings and Ring Gages
ANSI B89.1.9	Precision Inch Gage Blocks for Length Measurement (Through 20 in.)
ANSI B89.3.1	Measurement of Out-of-Roundness

#### 1.2 Classification

In this Standard, the term NOT GO, previously known as HI and LO, is used to identify functional diameter thread gages.

#### 1.3 Federal Government Use

When this Standard is approved by the Department of Defense and federal agencies and is incorporated into FED-STD-H28/6, Screw Thread Standard

for Federal Services, Section 6, the use of this Standard by the federal government will be subject to all requirements and limitations of FED-STD-H28/6.

### 2 BASIC PRINCIPLES

#### 2.1 Accuracy in Gaging

Thread plug gages are controlled by direct measuring methods. Thread ring gages, thread snap limit gages, and indicating thread gages are controlled by reference to the appropriate setting gages or direct measuring methods or both.

#### 2.2 Limitations of Gaging

**2.2.1** Product threads accepted by a gage of one type may be verified by other types. It is possible, however, that parts which are near a limit may be accepted by one type and rejected by another. Also, it is possible for two individual limit gages of the same type to be at opposite extremes of the gage tolerances permitted, and borderline product threads accepted by one gage could be rejected by another. For these reasons, a product screw thread is considered acceptable when it passes a test by any of the permissible gages in ANSI B1.3 for the gaging system specified, provided the gages being used are within the tolerances specified in this Standard.

**2.2.2** Gaging large product external and internal threads equal to or greater than 6.25 in. nominal size with plain and threaded plug and ring gages presents problems for technical and economic reasons. In these instances, verification may be based on use of modified snap or indicating gages or measurement of thread elements. Various types of gages or measuring devices in addition to those defined in this document are available and acceptable when properly correlated to this Standard. Producer and user should agree on the method and equipment used.