ASME B1.20.5-1991

(REVISION OF ANSI B1.20.5-1978)

REAFFIRMED 2024

GAGING FOR DRYSEAL PIPE THREADS (INCH)

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

Intentionally left blank

AN AMERICAN NATIONAL STANDARD

GAGING FOR DRYSEAL PIPE THREADS
(INCH)

ASME B1.20.5-1991

(REVISION OF ANSI B1.20.5-1978)

The American Society of
Mechanical Engineers

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

Date of Issuance: March 15, 1991

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.

ASME is the registered trademark of The American Society of Mechanical Engineers.

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 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 accepts responsibility for only those interpretations issued in accordance with governing ASME procedures and policies which preclude the issuance of interpretations 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 © 1991 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All Rights Reserved
Printed in U.S.A.

FOREWORD

(This Foreword is not part of ASME B1.20.5-1991.)

In 1973, the American National Standards Committee B2, which had formerly been responsible for pipe thread standards, was absorbed by ANSI Standards Committee B1 and reorganized as subcommittee 20. A complete rewrite of the B2.2-1968 Standard on Dryseal Pipe Threads was completed with the publication of ANSI B1.20.3-1976 for product threads and the ANSI B1.20.5-1978 Standard for Gaging.

The product thread standard ANSI B1.20.3 establishes two classes of dryseal pipe threads: Class 1 and Class 2. The classes differ only in inspection requirements. With Class 1 threads, inspection of root and crest truncation is not specified. Class 2 threads are identical to Class 1 threads except that inspection of root and crest truncation is required. This gaging standard includes 6-step crest and root check gages, which, within their limitations, should be helpful in establishing the degree of conformance of product threads.

When 6-step crest or root check gages are to be used, it is necessary to classify the product thread size into a size range (minimum, basic, or maximum) as shown in Fig. 1. The use of 3-step L1 thread gages for NPTF threads requires estimating the one third of a turn, plus or minus, from the basic notch on the gage to classify the thread as basic. Use of this same one third turn estimation is required to determine minimum and maximum ranges. This Standard includes 4-step taper thread gages to eliminate the need for estimating the one third turn deviation from basic necessary with 3-step or basic step gages. 3-step taper thread gages are included in Appendix A for those who may prefer to use them.

Crest and root check gages for NPTF threads are also covered in this Standard. Prior to the publication of ANSI B1.20.5-1978 many gage manufacturers had calculated diameters for and made such gages based on methods used for ANPT (MIL-P-7105) 6-step gages, which were calculated to the extremes of the minimum and maximum zones, where most product threads should never be, and which, further, is not the same logic used in calculating the pair of basic steps. The NPTF 6-step gages tabulated herein are based on the mid-point of each range as determined by the L_1 plug gage (minimum, basic, or maximum) for calculation of the truncation limits where most of the product threads should be (see Fig. 2).

It should be noted that all references to the turns of engagement method for inspection of product threads have been withdrawn from this Standard. Results obtained by that method were found to quite often disagree with those obtained by the step limit method described here within. Also, inconsistencies in the end threads on the product and gages do not provide for a constant disengagement point between the two. This does not however preclude the use of this method in any way as an acceptable means of inspecting taper pipe threads. When this method is chosen, customer and vendor should agree on gaging procedures and minimum/maximum acceptance limits on the turns of engagement. Information on this method can be found in Appendix D for reference.

The gaging data in this Standard supersedes that given in ANSI B1.20.5-1978. The proposed standard was submitted by Standards Committee B1 to the Secretariat and the American National Standards Institute. It was approved and formally designated as an American National Standard on January 22, 1991.

Intentionally left blank

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. Emanuelli, *Chairman*
H. W. Ellison, *Vice Chairman*
R. McGinnis, *Secretary*

COMMITTEE PERSONNEL

R. Anderson
J. Bein
A. Breed
R. Browning
R. Byrne
D. Cadieux
F. Cantrell
R. Chamerda
F. Ciccarone, *Alternate*
R. Dodge
P. Drake
H. W. Ellison
D. Emanuelli
C. Erickson
W. Farrell
G. Flannery
J. Heinz
W. Jatho, *Alternate*
F. Jones, *Alternate*
S. Johnson
S. Kanter
R. Lamport
R. LaNier
J. Levy
K. McCullough
J. McMurray
A. Painter
G. Russ
R. Sabatos
D. Satava
M. Schuster
E. Schwartz
R. Searr
R. Seppey
A. Shepherd
B. Shook
A. Strang
J. Sullivan
R. Tennis
A. Thibodeau
J. Trilling
M. Van Derwerken
C. Wilson

SUBCOMMITTEE B1.20 — PIPE THREADS

D. P. Cadieux, *Chairman*
A. F. Thibodeau, *Secretary*
C. F. Banks
M. J. Bibeau
P. F. Braun
J. A. Casner
W. O. Clinedinst
F. Dallas Jr.
D. M. Davidson
R. Dodge
W. C. Farrell Jr.
L. S. Feldheim
A. C. Flanders
G. Flannery
H. D. Goldberg
S. I. Kanter
W. A. Keaton
M. W. Rose
G. A. Russ
A. D. Shepherd
A. G. Strang

Intentionally left blank

CONTENTS

Foreword iii
Standards Committee Roster v

1 Gaging 1
1.1 Scope 1
1.2 How Dryseal Works 1
1.3 Limitations 1
1.4 Product Thread Designations 1
1.5 Inspection of Product Threads 2
1.6 Methods of Gaging Product Threads 2
1.7 Coordination of Gages 3
1.8 Use of Gages 3
1.9 Direct Measurement of Crest and Root Truncation 5
1.10 Inspection of Gages 5

2 Gages 7
2.1 Types and Functions of Gages 7
2.2 Taper Thread Gages 8
2.3 Thread Form 8
2.4 Gage Tolerance 8
2.5 Working Gage Dimensions 9
2.6 Master Gage Dimensions 9

Figures
1 Classification of NPTF Product Thread Size Using 4-Step Gages 4
2 Identification of Steps on 6-Step Crest or Root Check Gage 4
3 Relative Position Plus and Minus Standoff 6
4 Relative Position of Master Plugs and Rings to Working Gages 10

Tables
1 Gages and Tolerances 2
2 Function and Application of Gages Covered in ASME B1.20.5-1991 7
3 Tolerances for Working Plug and Ring Gages 11
4 Tolerances for Master Plug and Ring Gages 12
5 Diameter Equivalent of Variation in Load for Tools and Gages 13
6 Diameter Equivalent of Variation in Half Included Angle for Tools and Gages 14
7 Basic Dimensions for L_1 Ring Gages 16
8 Basic Dimensions for L_1 Short Ring Gages 18
9 Basic Dimensions for L_2 Ring Gages 20
10 Basic Dimensions for L_2 Short Ring Gages 22
11 Basic Dimensions for Crest Check Ring Gages 24

12 Basic Dimensions for Root Check Ring Gages 26
13 Basic Dimensions for L_1 Plug Gages, NPTF 28
14 Basic Dimensions for L_1 Short Plug Gages 30
15 Basic Dimensions for L_1 Plug Gages, NPSI 32
16 Basic Dimensions for L_3 Plug Gages 34
17 Basic Dimensions for L_3 Short Plug Gages 36
18 Basic Dimensions for Crest Check Plug Gages 37
19 Basic Dimensions for Root Check Plug Gages 38
20 Basic Dimensions of Master Ring Gages for L_1 and L_3 Taper Plug Gages 39
21 Basic Dimensions of Master Plug Gages for L_1 and L_2 Taper Ring Gages 40
22 Basic Dimensions of Master Gages for 6-Step Crest Ring and 6-Step Crest Plug Gages 41
23 Basic Dimensions of Master Gages for 6-Step Root Ring Gages and 6-Step Root Plug Gages 42

Appendices

A 3-Step Gages for Checking NPTF Threads 43
A1 Working Gage Dimensions 43

B Measurement of Pitch Diameter of Taper Threads Having an Included Taper of 0.0625 Inch per Inch 49
B1 Measurement of Pitch Diameter of Taper Thread Plug Gage 49
B2 Measurement of Pitch Diameter of Taper Thread Ring Gage 53

C Formulas For Calculating 6-Step Taper Plug and Ring Gage Dimensions 57

D The Turns Engagement Method of Gaging Product Threads 59

Figures

B1 Measurement of Pitch Diameter of Taper Thread Gages by the 2-Wire Method 50
B2 Horizontal Measurement of Pitch Diameter of Taper Thread Gages by the 3-Wire Method Using Sine Block 51
B3 Vertical Measurement of Pitch Diameter of Taper Thread Gages by the 3-Wire Method Using a Sine Fixture 52
B4 Measurement of Pitch Diameter E_o of Taper Thread Gages by the 4-Wire Method 53
B5 Measurement of Pitch Diameter E_m of Taper Thread Gages by the 4-Wire Method 54
B6 Measurement of Pitch Diameter of Taper Thread Ring Gage on Coordinate Measuring Machine With Ball Probe 55

Tables

A1 Basic Dimensions for L_1 3-Step Ring Gages 44
A2 Basic Dimensions for L_2 3-Step Ring Gages 45
A3 Basic Dimensions for L_1 3-Step Plug Gages, NPTF 46
A4 Basic Dimensions for L_3 3-Step Plug Gages 48
D1 Basic Turns Engagement 59

GAGING FOR DRYSEAL PIPE THREADS (INCH)

1 GAGING

1.1 Scope

The scope of this Standard is to provide information regarding practical dryseal thread inspection methods and commonly used gages for production evaluation purposes. All dimensions are in inches unless otherwise specified.

1.1.1 Federal Government Use. When this Standard is approved by the Department of Defense and the Federal agencies and is incorporated into FED-STD-H28/8, Screw-Thread Standards for Federal Services, Section 8, the use of this Standard by the Federal Government is subject to all the requirements and limitations of FED-STD-H28/8.

1.2 How Dryseal Works

The principle of dryseal threads is based on crest and root contact at handtight engagement at both major and minor diameters. Conformance to L_1, L_2, and L_3 functional size gages alone will not assure that the threads will be drysealed to ANSI B1.20.3 design specfications. In addition to functional size, the dryseal crest and root truncations must be held on both external and internal threaded products in order to be dryseal. This applies to both straight and taper dryseal threads.

1.3 Limitations

Industry has developed gaging practices over many years which have resulted in the common use of L_1, L_2, L_3, and plain taper plug and ring gages to evaluate dryseal pipe threads. These are functional gages intended to aid the manufacturer in the control of threading operations. It must be recognized that conformance to a functional gage or series of gages is not conclusive evidence of conformance to the design requirements of ANSI B1.20.3. For critical applications more extensive inspection and testing, not covered in this Standard, may be required in order to insure an acceptable seal.

1.3.1 These gaging practices used with proper tool configuration control, sound manufacturing and part support practices, and visual inspection have provided pipe threads that sealed acceptably for many producers of pipe threads.

1.3.2 These gages and gaging practices are intended to evaluate unused pipe threads. Once a thread joint is made up wrench tight, metal is deformed by design and may not be found acceptable using these described gages and methods. It is the user's responsibility to determine if the used thread will perform satisfactorily in its intended application.

1.4 Product Thread Designations

Dryseal pipe threads are designated by specifying in sequence the nominal size, threads per inch, thread symbol, and class where required.

EXAMPLES:
1/8-27 NPTF-1
1/8-27 NPTF-2
1/8-27 PTF-SAE SHORT
1/8-27 NPSF
1/8-27 NPSI

Each of the letters in the symbols has a definite significance as follows:

N = National (American) Standard
P = Pipe
T = Taper
S = Straight
F = Fuel and Oil
I = Intermediate

For further information see ANSI B1.20.3.

1.4.1 Reference Documents. The latest issues of the following documents form a part of this Standard to the extent specified herein.

ANSI/ASME B1.7
Nomenclature, Definitions and Letter Symbols for Screw Threads

ANSI B1.20.3
Dryseal Pipe Threads

ANSI B47.1
Gage Blanks