ASME B18.6.5M-2000
[Revision of ANSI/ASME B18.6.5M-1986(R1993)]

METRIC THREAD-FORMING AND THREAD-CUTTING TAPPING SCREWS

AN AMERICAN NATIONAL STANDARD

The American Society of
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The 2000 edition of this Standard is being issued with an automatic addenda subscription service. The use of an addenda allows revisions made in response to public review comments or committee actions to be published as necessary. The next edition of this Standard is scheduled for publication in 2005.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. The interpretations will be included with the above addenda service.

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

FOREWORD

ASME Standards Committee B18 for the standardization of bolts, screws, nuts, rivets, and similar fasteners was organized in March 1922 as Sectional Committee B18 under the aegis of the American Engineering Standards Committee (later the American Standards Association, then the United States of American Standards Institute, and, as of October 6, 1969, the American National Standards Institute, Inc.). The Society of Automotive Engineers and the American Society of Mechanical Engineers served as joint sponsors.

Subcommittee 3 was subsequently established and charged with the responsibility for technical content of standards covering slotted and recessed head screws. In accordance with a general realignment of the subcommittee structure on April 1, 1966, Subcommittee 3 was redesignated Subcommittee 6.

At its meeting on December 4, 1974, Standards Committee B18 authorized preparation of a series of standards for metric fasteners. Subcommittee 6 was assigned the responsibility for developing product standards covering metric machine screws and tapping screws.

In subsequent meetings of Subcommittee 6, held over the ensuing two years, the content of the proposed metric standards was discussed and organized. It was decided the coverage should be limited to flat countersunk, oval countersunk, and pan head styles having slotted and Types I and IA cross-recessed drive provisions and the hex and hex washer head designs. The spaced thread tapping screws would cover soft converted sizes 2.2, 2.9, 3.5, 4.2, 4.8, 5.5, 6.3, 8, and 9.5 for Types AB and B thread-forming screws and Types BF and BT thread-cutting designs. Metric coarse series thread sizes 2, 2.5, 3, 3.5, 4, 5, 6, 8, and 10 would apply for Types D, F, and T thread-cutting tapping screws. Also, it was the consensus that the respective head envelopes for both machine screws and tapping screws of comparable sizes should remain consistent with established inch practices. In 1976, the Industrial Fasteners Institute published IFI-502, documenting dimensions and specifications as then agreed upon and coordinated to the extent possible with International Organization for Standardization (ISO) proposals, which Subcommittee 6 authorized as a first draft proposal for the metric tapping screw document.

Because the common head for machine and tapping screw approach differed considerably from existing metric practices and ISO drafts, particularly in regard to countersunk heads, a task group was established at the September 1977 meeting of the subcommittee to develop proportions for a common 90-deg flat countersunk recessed head having adequate head-to-shank strength combined with satisfactory driveability. Also at this meeting, it was recommended that consideration be given to developing a hex flange head having a smaller hex width across flats, similar to the metric hex flange screws evolving under Subcommittee 2 for larger product sizes. This head would be applicable to both machine and tapping screws and would be intended to replace the hex washer head, which, in some sizes, was difficult to manufacture and had less than desirable driving capabilities. Over the ensuing years, the recommendations resulting from the task group studies along with other actions taken by Subcommittee 6 were coordinated through Subcommittee 4 with the appropriate ISO/TC2 working groups toward resolution of dimensional differences. At the March 1980 meeting of ISO/TC2, tentative agreement was reached on the envelopes for the flat, oval, pan, and hex heads. These actions were confirmed by Subcommittee 6 at the October 22, 1980 meeting, and a review of the cross-recess dimensions was initiated. At the December 9, 1981 meeting, the subcommittee, following approval of the proposed format, authorized preparation of a formal draft standard that would include substituting the hex flange head for the hex washer head. On May 26, 1982 it was agreed to add a short shoulder under the head of heat-treated flat countersunk head screws, and approval was granted for numerous other refinements.

A proposed draft of the standard was prepared and approved by letter ballot to Subcommittee 6 and ASME Standards Committee B18 on June 24, 1985. Following acceptance by these respective groups, this proposal was approved by the sponsors and submitted by the ASME Board of Standardization to the American National Standards Institute. It was approved and formally designated an American National Standard on February 3, 1986.

In 1997 Subcommittee 6 initiated work to revise the head diameters for flat head screws, length measurement method for oval head screws, height inspection for oval head screws, and quality assurance. Protrusion height inspection for oval head screws, ductility testing, and hydrogen embrittlement testing were also added. These changes were balloted and approved by the ASME B18 Committee. The proposal was submitted to the American National Standards Institute and designated an American National Standard on May 19, 2000.

ASME STANDARDS COMMITTEE B18
Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

SUBCOMMITTEE 6 — SLOTTED AND RECESSED HEAD SCREWS

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CORRESPONDENCE WITH B18 COMMITTEE

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 requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B18 Main Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

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.

Interpretations. Upon request, the B18 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B18 Main Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B18 Main Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Main Committee.

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METRIC THREAD-FORMING AND THREAD-CUTTING TAPPING SCREWS

1 INTRODUCTORY NOTES

1.1 Scope

1.1.1 This Standard covers the complete general, dimensional, and performance requirements for the various types of slotted and recessed head metric tapping screws recognized as standard. Also included are appendices that provide specifications and instructions for protrusion gaging of flat countersunk head screws, across-corners gaging of hex head screws, and penetration and wobble gaging of recessed head screws. The appendices in this Standard also provide clearance hole size and approximate installation hole size recommendations.

1.1.2 The inclusion of dimensional data in this Standard is not intended to imply that all of the products described are stock production sizes. Consumers should consult with manufacturers concerning the availability of products. The recommended diameter–length combinations applicable to metric tapping screws are shown in Table 22.

1.2 Comparison With ISO Standards

1.2.1 The dimensions for flat countersunk, oval countersunk, pan, hex flange, and hex head tapping screws as countersunk, pan, and hex head tapping screws as presented in this Standard have been coordinated to the extent possible with International Organization for Standardization (ISO) standards. Where applicable, the comparable ISO standard is referenced in the footnotes to the dimensional tables for the respective screw products. Except for the recessed flat countersunk heads, the dimensional differences between tapping screws covered in this Standard and those in ISO standards are very few and relatively minor, and none will affect the functional interchangeability of screws manufactured to the requirements of either. For recessed flat countersunk head screws the head envelopes are identical in both standards; however, Types D, F, and T screws covered by this document feature a short shoulder under the head (with an attendant increase in the minimum grip length) and recess depths that are consistent with those in screws of other head styles and thread types.

1.2.2 Screws incorporating the Type III square recess, and thread-cutting tapping screws conforming to Types BF, BT, D, F, and T are not, as of this writing, covered by ISO standards.

1.2.3 Other differences exist in the designation of tapping screws covered by ISO standards and those covered by this document. For example, point Types AB and B in this Standard are designated Types C and F, respectively, by ISO.

1.2.4 Types I and IA cross recesses documented in this Standard are designated Types H and Z, respectively, in corresponding ISO standards.

1.2.5 Several nominal length differences exist.

1.3 Head Types

The head types covered by this Standard include those commonly recognized as being applicable to metric tapping screws and are listed and described as follows:

1.3.1 Flat Countersunk Head. The flat countersunk head shall have a flat top surface and a conical bearing surface with a head angle of 90 to 92 deg. Dimensions are given in Tables 8 through 11.

1.3.2 Oval Countersunk Head. The oval countersunk head shall have a rounded top surface and a conical bearing surface with a head angle of 90 to 92 deg. Dimensions are given in Tables 12 through 15.

1.3.3 Pan Head. The slotted pan head shall have a flat top surface rounding into cylindrical sides and a flat bearing surface. The recessed pan head shall have a rounded top surface blending into cylindrical sides and a flat bearing surface. Dimensions are documented in Tables 16 through 19.

1.3.4 Hex Head. The hex head shall have a flat or indented top surface, six flat sides, and a flat bearing surface. Dimensions are shown in Table 20.

1.3.5 Hex Flange Head. The hex flange head shall have a flat or indented top surface and six flat sides formed integrally with a frustoconical or slightly rounded (convex) flange that projects beyond the sides and provides a flat bearing surface. Dimensions are given in Table 21.

1.4 Screw Types and Application

Screws covered by this Standard include screws of both the thread-forming and thread-cutting varieties. The type designations, descriptions, and applications are as follows:

1.4.1 Thread-Forming Tapping Screws. Thread forming tapping screws are generally for application in materials where large internal stresses are permissible or desirable, to increase resistance to loosening. They shall be of the following types:

1.4.1.1 Type AB. Type AB tapping screws shall have spaced threads and gimlet points. They are primarily intended for use in thin metal, resin impregnated plywood, and asbestos compositions. Dimensions are given in Table 5.

1.4.1.2 Type B. Type B tapping screws shall have spaced threads, with the same pitches as Type AB, and blunt points with tapered entering threads having unfinished crests. They are intended for use in such materials as thin metal, nonferrous castings, resin impregnated plywood, certain resilient plastics, and asbestos compositions. Dimensions are given in Table 5.

1.4.2 Thread-Cutting Tapping Screws. Thread-cutting tapping screws are generally for application in materials where disruptive internal stresses are undesirable or where excessive driving torques are encountered with thread-forming tapping screws. They shall be of the following types:

1.4.2.1 Types BF and BT. Types BF and BT tapping screws shall have spaced threads with a blunt point and tapered entering threads having unfinished crests, as on Type B, with one or more cutting edges and chip cavities. These screws are intended for use in plastics, asbestos compositions, and other similar materials. Dimensions are given in Table 6.

1.4.2.2 Types D, F, and T. Types D, F, and T tapping screws shall have threads of machine screw diameter–pitch combinations (metric coarse thread series) approximating a 60-deg basic thread form (not necessarily conforming to any standard thread profile) with a blunt point and tapered entering threads with unfinished crests and having one or more cutting edges and chip cavities. Types D, F, and T tapping screws shall not be subject to thread gaging but shall meet all of the dimensions specified in Table 7. These screws are intended for use in aluminum, zinc, and lead die castings, steel sheets and shapes, cast iron, brass, plastics, etc.

1.5 Assembly Considerations

1.5.1 Finishes and Installation Hole Sizes. The finish (plating or coating) on tapping screws and the material composition and hardness of the mating component are factors that affect assembly torques in individual applications. Although the recommended installation hole sizes shown in Appendix B were originally based on the use of plain, unfinished carbon steel tapping screws, experience has shown that the specified holes are also suitable for screws having most types of commercial finishes. It should be noted, however, that due to various finishes providing different degrees of lubricity, some adjustment of installation torques may be necessary to suit individual applications. Also, where exceptionally heavy finishes are involved or screws are to be assembled into materials of higher hardness, some deviation from the specified hole sizes may be required to provide optimum assembly. The necessity and extent of such deviations can best be determined by experiment in the particular assembly environment.

1.5.2 Clearance Holes. Recommended nominal diameters of clearance holes for use in components to be assembled using tapping screws are given in Appendix A.

1.6 Dimensions

All dimensions in this Standard are given in millimeters unless stated otherwise.

1.7 Options

Options, where specified, shall be at the discretion of the manufacturer unless otherwise agreed upon by the manufacturer and purchaser.

1.8 Terminology

For definitions of terms relating to fasteners or to component features thereof used in this Standard, refer to ASME B18.12.

1.9 Designation

1.9.1 To promote uniformity and understanding in communications relating to products conforming to this Standard, it is recommended that metric tapping screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name, including head style and driving provision
(b) designation of the standard
(c) nominal size
(d) thread pitch
(e) nominal length
(f) thread and point type
(g) material
(h) protective finish, if required

EXAMPLES:
(1) Slotted Pan Head Tapping Screw, ASME B18.6.5M, 6.3 × 1.8 × 30, Type AB, Steel, Zinc Plated.
(2) Type 1A Cross-Recessed Pan Head Tapping Screw, ASME B18.6.5M, 4.2 × 1.4 × 13, Type BF, Steel, Chromium Plated.
(3) Type 1 Cross-Recessed Oval Countersunk Head Tapping Screw, ASME B18.6.5M, 4.2 × 1.4 × 13, Type BF, Steel, Chromium Plated.
(4) Hex Flange Head Tapping Screw, ASME B18.6.5M, 10 × 1.5 × 40, Type D, Steel.

1.9.2 For a recommended part identifying numbering (PIN) system, see ASME B18.24.1.

1.10 Referenced Standards

The following is a list of publications referenced in this Standard. Unless otherwise specified, the most recent standard available shall be used.

ASME B1.1, Unified Inch Screw Threads (UN and UNR Thread Form)[1]
ASME B1.13M, Metric Screw Threads — M Profile[1]
ASME B18.12, Glossary of Terms for Mechanical Fasteners[1]
ASME B18.18.1M, Inspection and Quality Assurance for General Purpose Fasteners[1]
ASME B18.18.2M, Inspection and Quality Assurance for High Volume Machine Assembly Fasteners[1]
ASME B18.24.1, Part Identifying Number (PIN) Code System Standard for B18 Externally Threaded Products[1]

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007

ISO 1478, Tapping Screws Thread[1]
ISO 1479, Hexagon Head Tapping Screws[1]
ISO 1481, Slotted Pan Head Tapping Screws[1]
ISO 1482, Slotted Countersunk (Flat) Head Tapping Screws (common head style)[1]
ISO 1483, Slotted Raised Countersunk (Oval) Head Tapping Screws (common head style)[1]
ISO 7049, Cross Recessed Pan Head Tapping Screws[1]
ISO 7050, Cross Recessed Countersunk (Flat) Head Tapping Screws (common head style)[1]
ISO 7051, Cross Recessed Raised Countersunk (Oval) Head Tapping Screws[1]
ISO 10509, Hex Flange Head Tapping Screws[1]

Publisher: International Organization for Standardization (ISO), 1 rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

1.11 Inspection and Quality Assurance

Unless otherwise specified, acceptability to this Standard shall be determined in accordance with ASME B18.18.1M.

When applicable, the following designated characteristics shall be inspected to the inspection levels shown according to ASME B18.18.2M and shall be within their specified limits.

Designated Characteristic	Inspection Level
Recess penetration depth	C
Slot depth	C
Width across corners	C
Major diameter	C
Drive test	C
Torsional strength test	C
Ductility test	C
Hydrogen embrittlement test	C

If verifiable in-process inspection is used, inspection sample sizes and reporting shall be in accordance with the applicable ASME, ASTM, or SAE quality system consensus standard.

For nondesignated dimensional characteristics, the provisions of ASME B18.18.1M shall apply. If a nondesignated dimension is determined to be outside its specified limits, it shall be deemed conforming to this Standard if the user who is the installer accepts the dimension, based on form, fit, and function considerations.

[1] May also be obtained from the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036.

2 GENERAL DATA

2.1 Screw Heads

2.1.1 Head Height. All dimensions pertaining to head height specified in the dimensional tables shall be measured parallel to the axis of screw, and those relating to the top of the head shall represent a metal-to-metal measurement. In other words, any truncation of rounded head contours due to the slot or recess shall not be considered part of the head height.

Total or overall head heights shall be measured from the top of the head to the bearing surface for perpendicular bearing surface type heads and to the junction of the conical bearing surface with the basic screw diameter for flat countersunk heads.

Head side heights shall be measured from the theoretical intersection of the top surface of the head with the head diameter to the plane of the bearing surface for flat bearing surface type heads, and to the junction of conical bearing surface with the basic screw diameter for countersunk heads. The raised head height shall be measured from the theoretical intersection of the head top surface with the head diameter to the top of the head.

On countersunk heads, the junction of the conical bearing surface with the basic screw diameter may not necessarily be the same as the actual junction of head with shank, and the head height delineating the conical bearing surface is a reference dimension.

2.1.2 Bearing Surface. The bearing surface of perpendicular bearing surface-type screw heads shall be at right angles to the axis of screw shank within 2 deg.

2.1.3 Recess Depth. The recess depth in recessed head screws shall be measured, parallel to the axis of screw, from the intersection of the maximum diameter of Types I and IA recesses and the square sides of the Type III recess with the head surface to the bottom of the recess.

Recess penetration gaging depth values are included in the respective dimensional tables. The method of gaging and specifications for gages are covered in Appendix III.

Recess wobble gaging procedures and acceptable limits are contained in Appendix IV.

2.1.4 Slot Depth. The slot depth in slotted head screws shall be measured, parallel to the axis of the screw, from the top of the head to the intersection of the bottom of the slot with the head surface or bearing surface. On slotted pan heads, the unslotted thickness shall be measured, parallel to the axis of the screw, from the bearing surface to the intersection of the bottom of the slot with the head diameter.

2.1.5 Feature Positional Tolerances. The positional relationship of the heads and driving provisions of screws with respect to the shanks of screws (formerly defined as eccentricity) shall be as follows:

2.1.5.1 Head True Position. The axis of the head shall be located at true position relative to the axis of the screw shank within a tolerance zone having a diameter equivalent to 6% of the specified maximum head diameter, or maximum width across flats of hex and hex flange heads, regardless of feature size.

2.1.5.2 Recess True Position. The recess in recessed head screws shall be located at true position relative to the axis of the screw shank within a tolerance zone having a diameter equivalent to 12% of the basic screw diameter or 0.75 mm, whichever is greater, regardless of feature size.

2.1.5.3 Slot True Position. The slot in slotted head screws shall be located at true position relative to the axis of the screw shank within a tolerance zone having a width equivalent to 12% of the basic screw diameter or 0.50 mm, whichever is greater, regardless of feature size.

2.1.6 Underhead Fillets. All screws shall have a fillet radius at the junction of the head and shank within the limits specified in the dimensional tables. For flat and oval countersunk head screws, the maximum and minimum fillet radii are equal to 0.4 and 0.2 times the basic screw diameter, respectively, rounded to one decimal place. For pan, hex, and hex flange head screws, the fillet shall be a smooth and continuous concave curve fairing smoothly into the underhead bearing surface with a diameter of tangency not to exceed the tabulated D_A maximum and with no radius in the fillet contour being less than the specified R minimum.

2.2 Length

2.2.1 Measurement. The nominal screw length, L, shall be measured, parallel to the axis of screw, from the extreme point to the plane of the bearing surface for screws having perpendicular bearing surface-type heads. For screws having countersunk-type heads, L shall be measured to the theoretical intersection of the top surface of the head with the head diameter. For all oval heads, the overall length, L_o, shall be measured, parallel to the axis of the screw, from the extreme point to the top of the head, where $L_o = L + O$.

2.2.2 Length Tolerance. The length tolerance shall apply to L_o for all oval heads, and to L for all other head styles. The tolerance on the length of tapping screws shall conform to the following for the respective screw types:

2.2.2.1 Type AB. The tolerance on length of Type AB tapping screws shall be as tabulated below:

Nominal Screw Length	Tolerance on Length, mm
Up to 25 mm, inclusive	±0.8
Over 25 mm	±1.3

2.2.2.2 Types B, BF, BT, D, F, and T. The tolerance on length of these types of tapping screws shall be as tabulated below:

Nominal Screw Length	Tolerance on Length, mm
Up to 20 mm, inclusive	−0.8
Over 20 to 40 mm, inclusive	−1.2
Over 40 mm	−1.5

2.2.3 Standard Lengths. The recommended standard diameter–length combinations applicable to the respective tapping screw types and head styles are shown in Table 22.

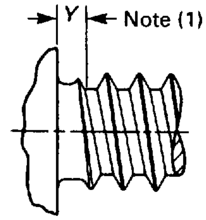
2.3 Threads and Points

The threads and points applicable to screws covered by this Standard are generally described under para. 1.4. For details and dimensions, refer to the tables documenting the screw types.

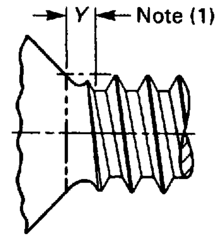
2.4 Thread Length

2.4.1 The thread length on tapping screws shall conform to the following for screw types:

2.4.1.1 Types AB, B, BF, and BT. These types of screws having nominal lengths equal to or shorter than those listed in the "Nominal Screw Length" column of Table 1 shall have full-form threads extending close to the head such that the specified minor diameter limits are maintained to within Y distance from the underside of the head, or closer if practicable. See Table 1. Unless otherwise specified by the purchaser, screws of longer nominal lengths shall have a length of full-form thread, measured parallel to the axis of screw, equal to or greater than B as specified in Table 1 and depicted in the illustrations accompanying the dimensional tabulations.



Pan, Hex, and
Hex Flange
Head Screws



Flat and Oval
Countersunk
Head Screws

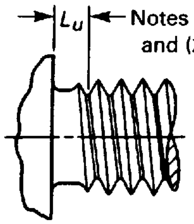
TABLE 1 THREAD LENGTHS FOR TYPES AB, B, BF, AND BT TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Nominal Screw Length, L	Max. Unthreaded Length, Y [Note (2)]	Min. Full Form Thread Length, B [Note (3)]
2.2 × 0.8	16	0.8	13.0
2.9 × 1	20	1.1	17.0
3.5 × 1.3	25	1.3	21.0
4.2 × 1.4	30	1.4	25.0
4.8 × 1.6	35	1.6	29.0
5.5 × 1.8	40	1.8	33.0
6.3 × 1.8	45	1.8	38.0
8 × 2.1	45	2.1	38.0
9.5 × 2.1	50	2.1	38.0

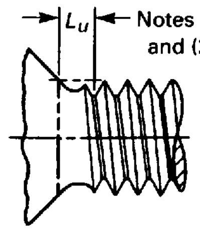
GENERAL NOTE: Dimensions are in millimeters.

NOTES:
(1) Refer to para. 2.4.1.1.
(2) Tabulated values are equal to one times the basic thread pitch, rounded to the nearest 0.1 mm.
(3) Refer to illustrations for respective screw head styles (Tables 8 through 21). Tabulated values through the 6.3-mm size are equal to six times the basic screw diameter rounded to the nearest millimeter.

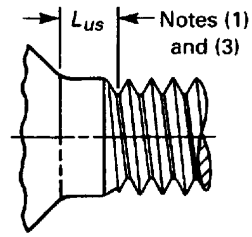
2.4.1.2 Types D, F, and T. These types of screws having nominal lengths that fall within the ranges listed in the second, fifth, and sixth columns of Table 2 shall have full-form threads extending to within the respective L_u or L_{us} unthreaded length limits from the underside of the head, or closer, if practicable. Unless otherwise specified by the purchaser, screws of longer nominal lengths than those listed in the ninth column of Table 2 shall have a length of full-form thread, measured parallel to the axis of screw as depicted



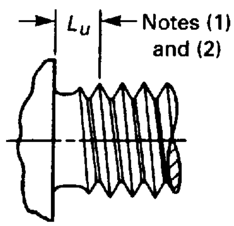
Types D and T:
Pan, Hex, and
Hex Flange
Head Screws



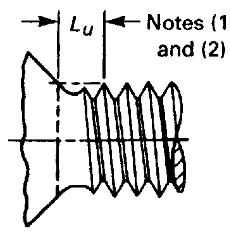
Types D and T:
Oval Countersunk and
Slotted Flat Countersunk
Head Screws



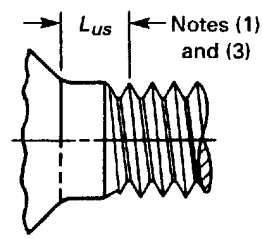
Types D and T:
Recessed Flat
Countersunk
Head Screws



Type F:
Pan, Hex, and
Hex Flange
Head Screws



Type F:
Oval Countersunk and
Slotted Flat Countersunk
Head Screws



Type F:
Recessed Flat
Countersunk
Head Screws

TABLE 2 THREAD LENGTHS FOR TYPES D, F, AND T TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Nominal Screw Length Equal To or Shorter Than, L	Max. Unthreaded Length [Note (1)] L_{us} [Note (3)]	Max. Unthreaded Length [Note (1)] L_u [Note (2)]	Nominal Screw Length, L Over	Nominal Screw Length, L To and Including	Max. Unthreaded Length [Note (1)] L_{us} [Note (3)]	Max. Unthreaded Length [Note (1)] L_u [Note (2)]	Nominal Screw Length Longer Than, L	Min. Full Form Thread Length, B [Note (4)]
M2 × 0.4	6	1.0	0.4	6	30	1.0	0.8	16	12.0
M2.5 × 0.45	8	1.1	0.5	8	30	1.1	0.9	20	15.0
M3 × 0.5	9	1.2	0.5	9	30	1.2	1.0	25	18.0
M3.5 × 0.6	10	1.5	0.6	10	50	1.5	1.2	30	21.0
M4 × 0.7	12	1.8	0.7	12	50	1.8	1.4	35	24.0
M5 × 0.8	15	2.0	0.8	15	50	2.0	1.6	40	30.0
M6 × 1	18	2.5	1.0	18	50	2.5	2.0	45	38.0
M8 × 1.25	24	3.1	1.2	24	50	3.1	2.5	45	38.0
M10 × 1.5	30	3.8	1.5	30	50	3.8	3.0	45	38.0
M12 × 1.75	36	4.4	1.8	36	50	4.4	3.5	50	38.0

GENERAL NOTES:
(a) Refer to para. 2.4 of General Data.
(b) Dimensions are in millimeters.

NOTES:
(1) For types D and T tapping screws, unthreaded lengths L_u and L_{us} represent the distance, measured parallel to the axis of the screw, from the underside of the head to the face of a nonchamfered or noncounterbored thread ring gage set to the maximum Class 6H limit, assembled by hand as far as the thread will permit. For Type F tapping screws, unthreaded lengths L_u and L_{us} represent the distance, measured parallel to the axis of the screw, from the underside of the head to point where the specified thread major limits are maintained.
(2) The L_u values shall apply to all screws except those cited in Note (3).
(3) The L_{us} values shall apply only to recessed flat countersunk head screws.
(4) Refer to the illustrations for respective screw head styles (Tables 3 through 15).

in the illustrations accompanying the dimensional tabulations, equal to or greater than the *B* lengths specified.

2.5 Body Diameter

2.5.1 The body diameter (unthreaded portion) on tapping screws shall conform to the following:

2.5.1.1 Types AB, B, BF, and BT. The body diameter shall not be less than the minimum minor diameter nor greater than the maximum major diameter of the thread.

2.5.1.2 Types D, F, and T. The body diameter shall not be less than the minimum limit specified in Table 7 or greater than the maximum major diameter of the thread.

2.6 Straightness

At maximum material condition, the derived median line of the screw body diameter and thread major diameter shall lie within a straightness tolerance diameter equal to 0.006*L* for nominal lengths, *L*, 300 mm or shorter, and 0.008*L* for screws having nominal lengths, *L*, over 300 mm through 600 mm. For screws with conical bearing surface type heads, reduce the nominal length, *L*, by the specified maximum head or raised head height, *K*, prior to calculating the straightness tolerance diameter. A gage and gaging procudure for checking straightness is given in Appendix A of ASME B18.2.3.1M.

2.7 Material and Heat Treatment

2.7.1 Steel. Tapping screws are normally fabricated from carbon steel and suitably processed to meet the performance and test requirements set forth under section 3 of these specifications.

2.7.1.1 Marking. When so specified by the purchaser, metric hex and hex flange head steel tapping screws shall be permanently and legibly marked with the numeral "2" on the top of the head.

2.7.2 Other Materials. Tapping screws may also be made from corrosion-resistant steel, monel, brass, and aluminum alloys. The materials, properties, and performance characteristics applicable to such screws shall be as mutually agreed upon between the manufacturer and the purchaser.

2.8 Finishes

Unless otherwise specified, tapping screws shall be supplied with an unplated or uncoated natural (as processed) finish. Where corrosion preventative treatment is required, screws shall be plated or coated as agreed upon between the manufacturer and the purchaser. When carbon steel screws are plated or coated and may be subject to hydrogen embrittlement, they shall be suitably treated after the plating or coating operation to obviate such embrittlement.

2.9 Workmanship

Tapping screws shall be free from surface irregularities affecting their serviceability, such as excessive burrs, seams, laps, loose scale, and other irregularities.

3 PERFORMANCE REQUIREMENTS AND TESTS FOR STEEL TAPPING SCREWS

3.1 Purpose

The primary objective of these performance requirements is to ensure that steel tapping screws will form or cut mating threads in materials of construction into which they are normally driven, without deforming their own threads and without breaking during installation or service.

3.1.1 Material and Processing Considerations. Certain limitations on the basic material and the manufacturing processes are incorporated herein because the size and configuration of the parts under consideration make them vulnerable to relatively small variations in chemistry, heat treatment, etc., and because experience has shown consistent "in balance." Until such improved performance tests are developed, the limitations specified under para. 3.6 shall supplement the performance features of this Standard.

3.1.2 Finish Considerations. Where screws are plated after delivery to the purchaser (or where plating of screws is otherwise under the control of the purchaser), the screw manufacturer shall not be responsible for failures determined to arise from plating. In such cases, additional screws from the same lot shall be stripped of plating, baked, lubricated with machine oil, and retested in the plain finish condition.

3.2 Drive Test for Types AB, B, D, F, and T Screws

Sample lots of these types of tapping screws (coated or uncoated, as received) shall, without deforming their own thread, according to type, form or cut a mating thread in the test plate described in para. 3.2.1 until a thread of full diameter is completely through the test plate.

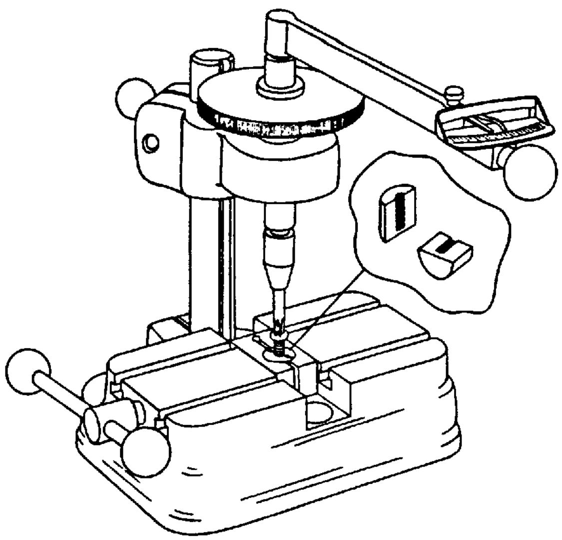


FIG. 1 TYPICAL TORSIONAL STRENGTH TEST FIXTURE

NOTE: This test does not apply to Types BF and BT tapping screws.

3.2.1 Test Plates. Test plates shall be prepared from low-carbon, cold-rolled steel having a hardness of 70 to 85 HRB, or equivalent, and a thickness as specified in Table 3. The test holes shall be drilled, punched, and redrilled, or reamed to within ±0.03 mm of the nominal diameter specified in Table 3 for the type and size of screw being tested.

3.3 Torsional Strength Test for All Types of Screws

The shank of the sample screw (coated or uncoated, as received) shall be securely clamped in a mating, split, blind hole die (see Fig. 1), or other equivalent means, such that the following requirements are met:

(*a*) the clamped portion of the threads is not damaged

(*b*) at least two full-form threads project above the clamping device

(*c*) at least two full-form threads exclusive of the point taper or the flutes are held within the clamping device (a blind hole may be used in place of the clamping device, provided the hole depth ensures that screw breakage will occur beyond the point taper or the full length of the flutes)

By means of a suitably calibrated torque-measuring device, torque shall be applied to the screw until failure occurs. The torque required to cause failure shall equal or exceed the minimum value specified in Table 4 for the type and size of screw being tested.

TABLE 3 STANDARD TEST PLATE THICKNESSES AND HOLE SIZES FOR DRIVE TEST INSPECTION OF TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Test Plate Thickness		Test Hole Diameter, ±0.03
	Max.	Min.	
Types AB and B			
2.2 × 0.8	1.27	1.17	1.90
2.9 × 1	1.27	1.17	2.20
3.5 × 1.3	1.96	1.85	2.90
4.2 × 1.4	3.22	3.12	3.50
4.8 × 1.6	3.22	3.12	4.00
5.5 × 1.8	3.22	3.12	4.80
6.3 × 1.8	4.84	4.69	5.50
8 × 2.1	4.84	4.69	6.90
9.5 × 2.1	4.84	4.69	8.30
Types D, F, and T			
2 × 0.4	2.03	1.93	1.70
2.5 × 0.45	2.44	2.33	2.10
3 × 0.5	2.82	2.71	2.60
3.5 × 0.6	3.62	3.51	3.10
4 × 0.7	3.62	3.51	3.50
5 × 0.8	4.84	4.68	4.50
6 × 1	6.43	6.27	5.40
8 × 1.25	8.02	7.86	7.40
10 × 1.5	9.60	9.44	9.30

GENERAL NOTE: Dimensions are in millimeters.

3.4 Ductility Test

The sample screw shall be inserted into a hole in a hardened 10-deg wedge block or other suitable device. The hole shall be 0.5 to 1.0 mm larger than the nominal screw diameter. An axial compressive load shall be applied against the top of the screw head and continued until the plane of the underhead bearing surface is bent permanently through 10 deg with respect to a plane perpendicular to the axis of the screw. This may be accomplished by applying single or repeated blows using a hammer, as necessary, to achieve a permanent bend. Head separation shall be cause for rejection.

3.5 Hydrogen Embrittlement Test

Plated or coated screws shall be installed into a steel test plate as specified in Table 3 with the head of the screw seated against a standard steel flat washer for protruding style heads or against a mating countersunk

TABLE 4 TORSIONAL STRENGTH REQUIREMENTS FOR TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Min. Torsional Strength, N·m
Types AB, B, BF, and BT	
2.2 × 0.8	0.4
2.9 × 1	1.5
3.5 × 1.3	2.7
4.2 × 1.4	4.4
4.8 × 1.6	6.3
5.5 × 1.8	9.9
6.3 × 1.8	16
8 × 2.1	33
9.5 × 2.1	67
Types D, F, and T	
2 × 0.4	0.5
2.5 × 0.45	1.1
3 × 0.5	2.0
3.5 × 0.6	3.1
4 × 0.7	4.6
5 × 0.8	9.4
6 × 1	16
8 × 1.25	40
10 × 1.5	78

GENERAL NOTE: Refer to Fig. 1 for an illustration of a typical torsional strength test fixture.

steel spacer for flat and oval style heads. Additional washers should be used under the bearing washer or spacer as necessary to provide a minimum stack thickness corresponding to the maximum unthreaded length on screws threaded full length. For longer screws having an unthreaded shank portion, cold-rolled steel spacers of a length that will ensure that full-form thread engagement is maintained within the test plate thickness shall be used between the spacer or washer and the test plate. The screws shall be tightened to a torque equivalent to 80% of the failure torque determined by tightening five screws to failure (i.e., screw breakage into two or more parts or thread stripping in the test plate) and obtaining the average failure torque of the five screws. The screws shall be allowed to remain in this tightened state for 24 hr. The original test torque (80% of the failure torque average) shall then be reapplied, and the screws shall be disassembled by the application of removal torque. There shall be no evidence of failure of the screws.

3.6 Material and Processing Requirements

3.6.1 Material. Screws shall be made from cold heading quality, killed steel wire conforming to the chemical composition limits shown in Table 23.

3.6.2 Heat Treatment. Screws shall be heat treated in a carbonitriding or gas carburizing system. They shall be quenched in a suitable liquid medium and then tempered by reheating to 340°C minimum. The use of cyaniding systems may be approved by a purchaser when the screw manufacturer shows that a continuous flow (no batch) process that is capable of consistently producing uniform case and core properties is employed.

3.6.2.1 Total Case Depth. Case depth, as measured at the thread flank midpoint between crest and root, shall conform to Table 24.

3.6.2.2 Surface Hardness After Tempering. The surface hardness shall be 45 HRC minimum or equivalent. For routine quality control (where case depth and geometry of screws will permit), the hardness measurements may be made on the end, shank, or head of the screw and shall be not less than 83 HR15N. As an alternate, or where the foregoing method is not applicable, a microhardness instrument with a Knoop or diamond pyramid indenter and a 500-g load may be used. In such cases, the measurements shall be made on the thread profile of a properly prepared longitudinal metallographic specimen.

3.6.2.3 Core Hardness After Tempering. The core hardness following tempering shall be 28 to 38 HRC, as determined at the mid-radius of a transverse section through the screw taken at a distance sufficiently behind the point of the screw to be through the full thread minor diameter. (The hardness shall not exceed the specified maximum and preferably should be no higher than 36 HRC to ensure against failure in assembly and service.)

3.6.2.4 Microstructure. The microstructure shall show no band of free ferrite between the case and core, as determined by metallographic examination.

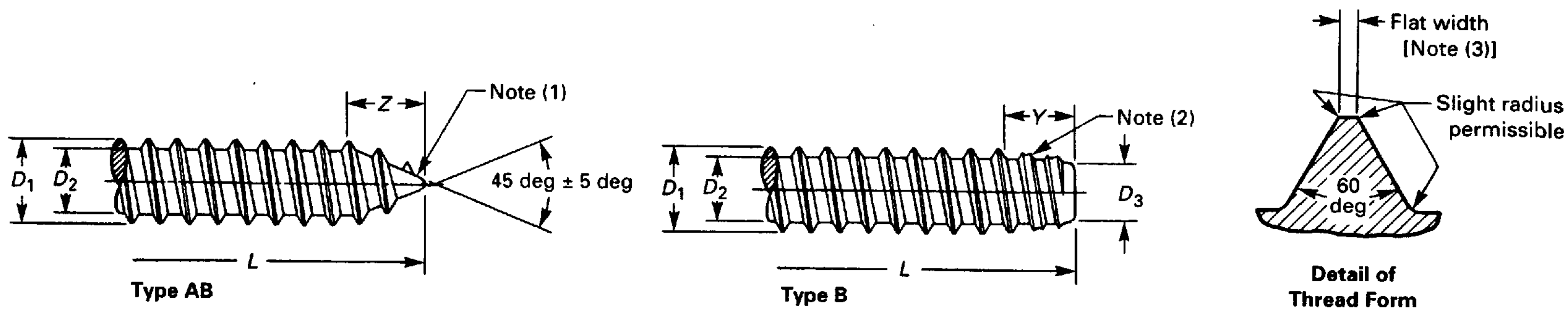
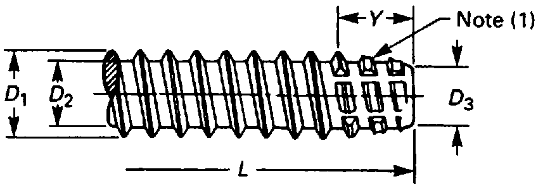


TABLE 5 DIMENSIONS OF THREADS AND POINTS FOR TYPES AB AND B THREAD-FORMING TAPPING SCREWS

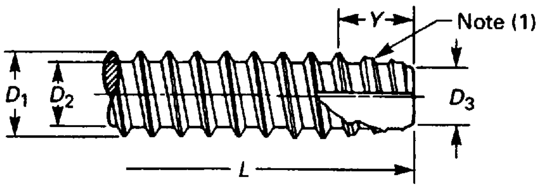
Nominal Screw Size and Thread Pitch, Reference [Note (4)]	Basic Screw Diameter, Reference [Note (4)]	Basic Thread Pitch, Reference [Note (4)]	Thread Major Diameter, D_1		Thread Minor Diameter, D_2		Point Diameter, D_3 [Note (5)]		Point Taper Length Type B, Y [Note (6)]		Point Length Factor Type AB, Z, Reference [Note (7)]	Minimum Practical Nominal Screw Length, L [Note (8)]			
												Type AB		Type B	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		Pan, Hex, and Hex Flange Heads	Flat and Oval Countersunk Heads	Pan, Hex, and Hex Flange Heads	Flat and Oval Countersunk Heads
2.2 × 0.8	2.184	0.79	2.24	2.10	1.63	1.52	1.47	1.37	1.6	1.2	2.0	4	6	4	5
2.9 × 1	2.845	1.06	2.90	2.76	2.18	2.08	2.01	1.88	2.1	1.6	2.6	6	7	5	7
3.5 × 1.3	3.505	1.27	3.53	3.35	2.64	2.51	2.41	2.26	2.5	1.9	3.2	7	9	6	8
4.2 × 1.4	4.166	1.41	4.22	4.04	3.10	2.95	2.84	2.69	2.8	2.1	3.7	8	10	7	10
4.8 × 1.6	4.826	1.59	4.80	4.62	3.58	3.43	3.30	3.12	3.2	2.4	4.3	9	12	8	11
5.5 × 1.8	5.486	1.81	5.46	5.28	4.17	3.99	3.86	3.68	3.6	2.7	5.0	11	14	9	12
6.3 × 1.8	6.350	1.81	6.25	6.03	4.88	4.70	4.55	4.34	3.6	2.7	6.0	12	16	10	13
8 × 2.1	7.938	2.12	8.00	7.78	6.20	5.99	5.84	5.64	4.2	3.2	7.5	16	20	12	17
9.5 × 2.1	9.525	2.12	9.65	9.43	7.85	7.59	7.44	7.24	4.2	3.2	8.0	19	24	14	19

GENERAL NOTES:
(a) Thread and point dimensions are in agreement with those given in ISO 1478.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

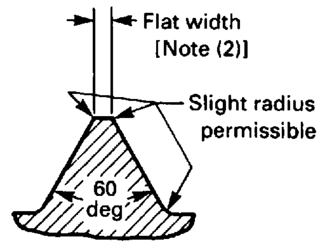
NOTES:
(1) No extrusion of excess metal beyond the apex of Type AB point resulting from thread rolling shall be permissible. A slight rounding or truncation of the point is desirable.
(2) The point on Type B screws shall be tapered, and the threads within the taper shall have unfinished crests.
(3) The width of flat at crest of thread shall not exceed 0.10 mm for sizes up to and including 4.2 mm and 0.15 mm for larger sizes.
(4) Basic screw diameter and basic thread pitch shall be used for calculation purposes wherever these factors appear in formulations for dimensions.
(5) The tabulated values shall apply to screw blanks prior to roll threading.
(6) The tabulated maximum limits are equal to approximately two times the thread pitch.
(7) The minimum effective grip length on Type AB tapping screws shall be determined by subtracting the point length factor from the minimum screw length.
(8) Lengths shown are theoretical minimums and are intended to assist the user in the selection of appropriate short screw lengths. Refer to Table 22 for recommended diameter–length combinations.



Type BF



Type BT



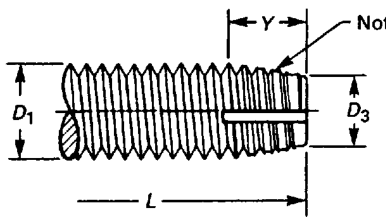
Detail of
Thread Form

TABLE 6 DIMENSIONS OF THREADS AND POINTS FOR TYPES BF AND BT THREAD-CUTTING TAPPING SCREWS

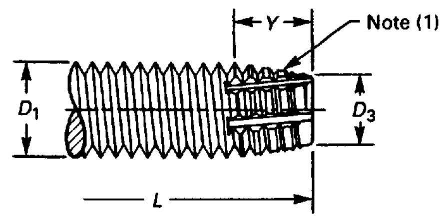
Nominal Screw Size and Thread Pitch	Basic Screw Diameter, Reference [Note (3)]	Basic Thread Pitch, Reference [Note (3)]	Thread Major Diameter, D_1		Thread Minor Diameter, D_2		Point Diameter, D_3 [Note (4)]		Point Taper Length, Y [Note (5)]		Minimum Practical Nominal Screw Length, L [Note (6)]	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Pan, Hex, and Hex Flange Heads	Flat and Oval Countersunk Heads
2.2 × 0.8	2.184	0.79	2.24	2.10	1.63	1.52	1.47	1.37	1.6	1.2	4	5
2.9 × 1	2.845	1.06	2.90	2.76	2.18	2.08	2.01	1.88	2.1	1.6	5	7
3.5 × 1.3	3.505	1.27	3.53	3.35	2.64	2.51	2.41	2.26	2.5	1.9	6	8
4.2 × 1.4	4.166	1.41	4.22	4.04	3.10	2.95	2.84	2.69	2.8	2.1	7	10
4.8 × 1.6	4.826	1.59	4.80	4.62	3.58	3.43	3.30	3.12	3.2	2.4	8	11
5.5 × 1.8	5.486	1.81	5.46	5.28	4.17	3.99	3.86	3.68	3.6	2.7	9	12
6.3 × 1.8	6.350	1.81	6.25	6.03	4.88	4.70	4.55	4.34	3.6	2.7	10	13
8 × 2.1	7.938	2.12	8.00	7.78	6.20	5.99	5.84	5.64	4.2	3.2	12	17
9.5 × 2.1	9.525	2.12	9.65	9.43	7.85	7.59	7.44	7.24	4.2	3.2	14	19

GENERAL NOTES:
(a) For additional requirements refer to section 2, titled General Data.
(b) Dimensions are in millimeters.

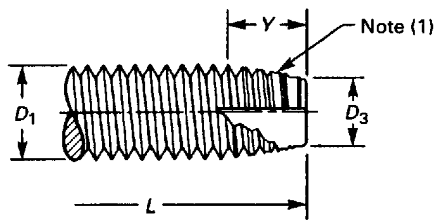
NOTES:
(1) Points of screws shall be tapered and fluted as illustrated above for the respective types. The flute on Type BT screws shall have an included angle of 90 to 95 deg and the thread cutting edge located above the axis of the screw. Tapered threads shall have unfinished crests, and the flutes shall extend through the first full-form thread beyond the taper. Other details of taper and flute design shall be optional with the manufacturer provided the screws will meet the specified performance requirements.
(2) The width of flat at crest of thread shall not exceed 0.10 mm for sizes up to and including 4.2 mm and 0.15 mm for larger sizes.
(3) Basic screw diameter and basic thread pitch shall be used for calculation purposes wherever these factors appear in formulations for dimensions.
(4) The tabulated values shall apply to screw blanks prior to roll threading.
(5) The tabulated maximum limits are equal to approximately two times the thread pitch.
(6) Lengths shown are theoretical minimums; and are intended to assist the user in the selection of appropriate short screw lengths. Refer to Table 22 for recommended diameter–length combinations.



Type D



Type F



Type T

TABLE 7 DIMENSIONS OF THREADS AND POINTS FOR TYPES D, F, AND T THREAD-CUTTING TAPPING SCREWS

Nominal Screw Size and Thread Pitch [Note (2)]	Thread Major Diameter, D_1		Point Diameter, D_3 [Note (3)]		Min. Body Diameter, D_S [Note (4)]	Point Taper Length, Y: For Short Screws [Note (5)]		Point Taper Length, Y: For Long Screws [Note (6)]		Min. Practical Nominal Screw Length, L [Note (7)]: Pan, Hex, and Hex Flange Heads	Min. Practical Nominal Screw Length, L [Note (7)]: Flat and Oval Countersunk Heads
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.		
2 × 0.4	2.00	1.88	1.45	1.39	1.65	1.4	1.0	1.8	1.4	4	5
2.5 × 0.45	2.50	2.37	1.88	1.82	2.12	1.6	1.1	2.0	1.6	4	6
3 × 0.5	3.00	2.87	2.32	2.26	2.58	1.8	1.3	2.3	1.8	5	6
3.5 × 0.6	3.50	3.35	2.68	2.60	3.00	2.1	1.5	2.7	2.1	5	8
4 × 0.7	4.00	3.83	3.07	2.97	3.43	2.5	1.8	3.2	2.5	6	9
5 × 0.8	5.00	4.82	3.94	3.84	4.36	2.8	2.0	3.6	2.8	7	10
6 × 1	6.00	5.79	4.69	4.55	5.21	3.5	2.5	4.5	3.5	9	12
8 × 1.25	8.00	7.76	6.40	6.24	7.04	4.4	3.1	5.6	4.4	11	16
10 × 1.5	10.00	9.73	8.08	7.88	8.86	5.3	3.8	6.8	5.3	13	18

GENERAL NOTES:
(a) For additional requirements refer to section 2, titled General Data.
(b) Dimensions are in millimeters.

NOTES:
(1) The points of screws shall be tapered and fluted as illustrated above for the respective types. The flute on Type T screws shall have an included angle of 90 to 95 deg and the thread cutting edge located above the axis of screw. Tapered threads shall have unfinished crests, and the flutes shall extend through the first full-form thread beyond the taper. Other details of taper and flute design shall be optional with the manufacturer provided the screws will meet the specified performance requirements.
(2) See para. 1.4.2.2 for thread form and acceptability.
(3) The tabulated values shall apply to screw blanks prior to roll threading.
(4) Minimum limits for body diameter (unthreaded portion) are tabulated for convenient reference. See para. 2.5 in General Data.
(5) Tabulated maximum and minimum limits are equal to 3.5 and 2.5 times the thread pitch, respectively, rounded to the nearest 0.1 mm. See Note (6) for applicability to screws.
(6) Tabulated maximum and minimum limits are equal to 4.5 and 3.5 times the thread pitch, respectively, rounded to the nearest 0.1 mm, and shall be applicable to screws of nominal lengths equal to or longer than those listed under Min. Practical Nominal Screw Length.
(7) Lengths shown are theoretical minimums; see Table 22 for recommended diameter–length combinations. Shorter screws are available with the point length reduced to the limits tabulated for short screws above.

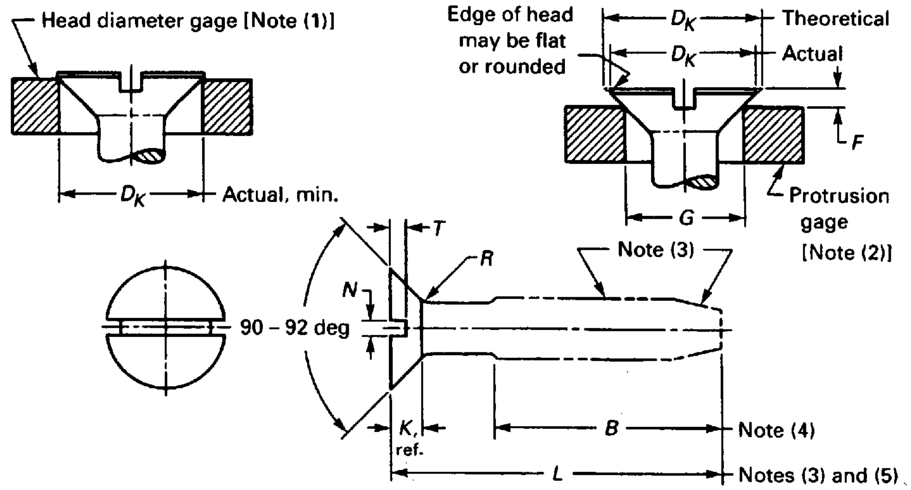


TABLE 8 DIMENSIONS OF SLOTTED FLAT COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Actual Head Diameter, D_K Max.	Actual Head Diameter, D_K Min. [Note (1)]	Max. Head Height, K, Reference	Underhead Fillet Radius, R Max.	Underhead Fillet Radius, R Min.	Slot Width, N Max.	Slot Width, N Min.	Slot Depth, T Max.	Slot Depth, T Min.	Head Protrusion Above Gage Diameter, F [Note (2)] Max.	Head Protrusion Above Gage Diameter, F [Note (2)] Min.	Protrusion Gage Diameter, G [Note (2)]
Types AB, B, BF, and BT [Note (3)]												
2.2 × 0.8	3.8	3.5	1.1	0.8	0.4	0.7	0.5	0.6	0.4	0.79	0.62	2.82
2.9 × 1	5.5	5.2	1.7	1.2	0.6	1.0	0.8	0.9	0.6	0.83	0.60	4.65
3.5 × 1.3	7.3	6.9	2.3	1.4	0.7	1.2	1.0	1.2	0.9	1.32	1.03	5.57
4.2 × 1.4	8.4	8.0	2.6	1.6	0.8	1.5	1.2	1.3	1.0	1.46	1.17	6.48
4.8 × 1.6	9.3	8.9	2.8	2.0	1.0	1.5	1.2	1.4	1.1	1.05	0.72	8.31
5.5 × 1.8	10.3	9.9	3.0	2.2	1.1	1.9	1.6	1.5	1.1	1.14	0.81	9.23
6.3 × 1.8	11.3	10.9	3.1	2.4	1.2	1.9	1.6	1.6	1.2	1.23	0.85	10.14
8 × 2.1	15.8	15.4	4.6	3.2	1.6	2.3	2.0	2.3	1.8	1.75	1.30	13.80
9.5 × 2.1	18.3	17.8	5.2	4.0	2.0	2.8	2.5	2.6	2.0	2.23	1.77	15.54
Types D, F, and T [Note (3)]												
2 × 0.4	3.8	3.5	1.2	0.8	0.4	0.7	0.5	0.6	0.4	0.79	0.62	2.82
2.5 × 0.45	4.7	4.4	1.5	1.0	0.5	0.8	0.6	0.7	0.5	0.88	0.66	3.74
3 × 0.5	5.5	5.2	1.7	1.2	0.6	1.0	0.8	0.9	0.6	0.83	0.60	4.65
3.5 × 0.6	7.3	6.9	2.3	1.4	0.7	1.2	1.0	1.2	0.9	1.32	1.03	5.57
4 × 0.7	8.4	8.0	2.7	1.6	0.8	1.5	1.2	1.3	1.0	1.46	1.17	6.48
5 × 0.8	9.3	8.9	2.7	2.0	1.0	1.5	1.2	1.4	1.1	1.05	0.72	8.31
6 × 1	11.3	10.9	3.3	2.4	1.2	1.9	1.6	1.6	1.2	1.23	0.85	10.14
8 × 1.25	15.8	15.4	4.6	3.2	1.6	2.3	2.0	2.3	1.8	1.75	1.30	13.80
10 × 1.5	18.3	17.8	5.0	4.0	2.0	2.8	2.5	2.6	2.0	2.23	1.77	15.54

GENERAL NOTES:
(a) The comparable ISO standard is ISO 1482.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

NOTES:
(1) Acceptability of minimum head diameter shall be determined using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(2) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly, and the proper protrusion values must be recalculated using the formulas shown in Appendix I.
(3) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(4) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(5) See Table 22 for recommended tapping screw nominal lengths.

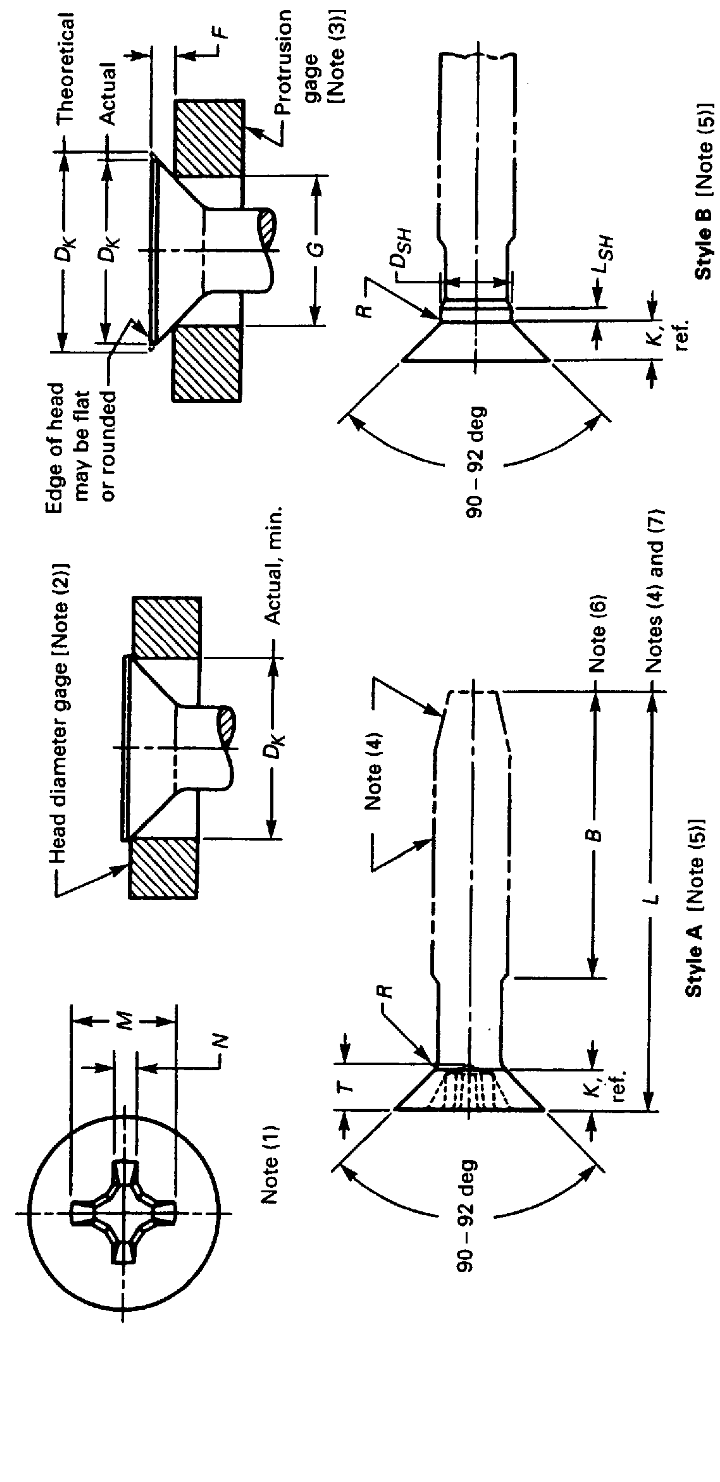


TABLE 9 ILLUSTRATION

TABLE 9 DIMENSIONS OF TYPE I CROSS-RECESSED FLAT COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Shoulder Diameter, D_{SH}		Actual Head Diameter, D_K [Note (2)]		Max. Head Height, K,	Shoulder Length, L_{SH}		Underhead Fillet Radius, R		Recess Diameter, M,	Recess Depth, T,	Recess Width, N,	Driver Size	Recess Penetration Gaging Depth		Head Protrusion Above Gage Diameter, F [Note (3)]		Protrusion Gage Diameter, G
	Max.	Min.	Max.	Min.	Reference	Max.	Min.	Max.	Min.	Reference	Reference	Reference		Max.	Min.	Max.	Min.	[Note (3)]
Types AB, B, BF, and BT [Note (4)]																		
2.2 × 0.8	...	...	3.8	3.5	1.1	...	...	0.8	0.4	2.14	1.54	0.53	0	1.55	1.25	0.79	0.62	2.82
2.9 × 1	...	...	5.5	5.2	1.7	...	...	1.2	0.6	3.10	2.08	0.79	1	2.10	1.70	0.83	0.60	4.65
3.5 × 1.3	...	...	7.3	6.9	2.3	...	...	1.4	0.7	4.06	2.25	0.91	2	2.20	1.70	1.32	1.03	5.57
4.2 × 1.4	...	...	8.4	8.0	2.6	...	...	1.6	0.8	4.46	2.65	0.96	2	2.60	2.10	1.46	1.17	6.48
4.8 × 1.6	...	...	9.3	8.9	2.8	...	...	2.0	1.0	5.06	3.25	1.04	2	3.20	2.70	1.05	0.72	8.31
5.5 × 1.8	...	...	10.3	9.9	3.0	...	...	2.2	1.1	6.32	3.41	1.08	3	3.20	2.70	1.14	0.81	9.23
6.3 × 1.8	...	...	11.3	10.9	3.1	...	...	2.4	1.2	6.62	3.61	1.12	3	3.50	3.00	1.23	0.85	10.14
8 × 2.1	...	...	15.8	15.4	4.6	...	...	3.2	1.6	8.78	4.88	1.80	4	4.60	4.00	1.75	1.30	13.80
9.5 × 2.1	...	...	18.3	17.8	5.2	...	...	4.0	2.0	9.88	5.98	1.98	4	5.70	5.10	2.23	1.77	15.54
Types D, F, and T [Note (4)]																		
2 × 0.4	2.00	1.86	3.8	3.5	1.2	0.50	0.30	0.8	0.4	2.14	1.54	0.53	0	1.55	1.25	0.79	0.62	2.82
2.5 × 0.45	2.50	2.36	4.7	4.4	1.5	0.55	0.35	1.0	0.5	2.80	1.78	0.74	1	1.80	1.40	0.88	0.66	3.74
3 × 0.5	3.00	2.86	5.5	5.2	1.7	0.60	0.40	1.2	0.6	3.10	2.08	0.79	1	2.10	1.70	0.83	0.60	4.65
3.5 × 0.6	3.50	3.32	7.3	6.9	2.3	0.70	0.50	1.4	0.7	4.06	2.25	0.91	2	2.20	1.70	1.32	1.03	5.57
4 × 0.7	4.00	3.82	8.4	8.0	2.7	0.80	0.60	1.6	0.8	4.46	2.65	0.96	2	2.60	2.10	1.46	1.17	6.48
5 × 0.8	5.00	4.82	9.3	8.9	2.7	0.90	0.70	2.0	1.0	5.06	3.25	1.04	2	3.20	2.70	1.05	0.72	8.31
6 × 1	6.00	5.82	11.3	10.9	3.3	1.10	0.90	2.4	1.2	6.62	3.61	1.12	3	3.50	3.00	1.23	0.85	10.14
8 × 1.25	8.00	7.78	15.8	15.4	4.6	1.40	1.10	3.2	1.6	8.78	4.88	1.80	4	4.60	4.00	1.75	1.30	13.80
10 × 1.5	10.00	9.78	18.3	17.8	5.0	1.70	1.30	4.0	2.0	9.88	5.98	1.98	4	5.70	5.10	2.23	1.77	15.54

GENERAL NOTES:
(a) For reference, see Table 9 illustration beginning on page 14.
(b) The comparable ISO standard is ISO 7050.
(c) For additional requirements refer to section 2, titled General Data.
(d) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a large center opening, tapered wings, and a blunt bottom, with all edges relieved or rounded.
(2) Acceptability of minimum head diameter shall be determined by using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(3) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly, and the proper protrusion values must be recalculated using the formulas shown in Appendix I.
(4) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(5) Recessed head Types D, F, and T tapping screws shall have Style B head form. Recessed head Types AB, B, BF, and BT tapping screws shall have Style A head form. The underhead shoulder is mandatory on Style B head form, and all other head dimensions shall be common for both the Style A and Style B head forms.
(6) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(7) See Table 22 for recommended tapping screw nominal lengths.

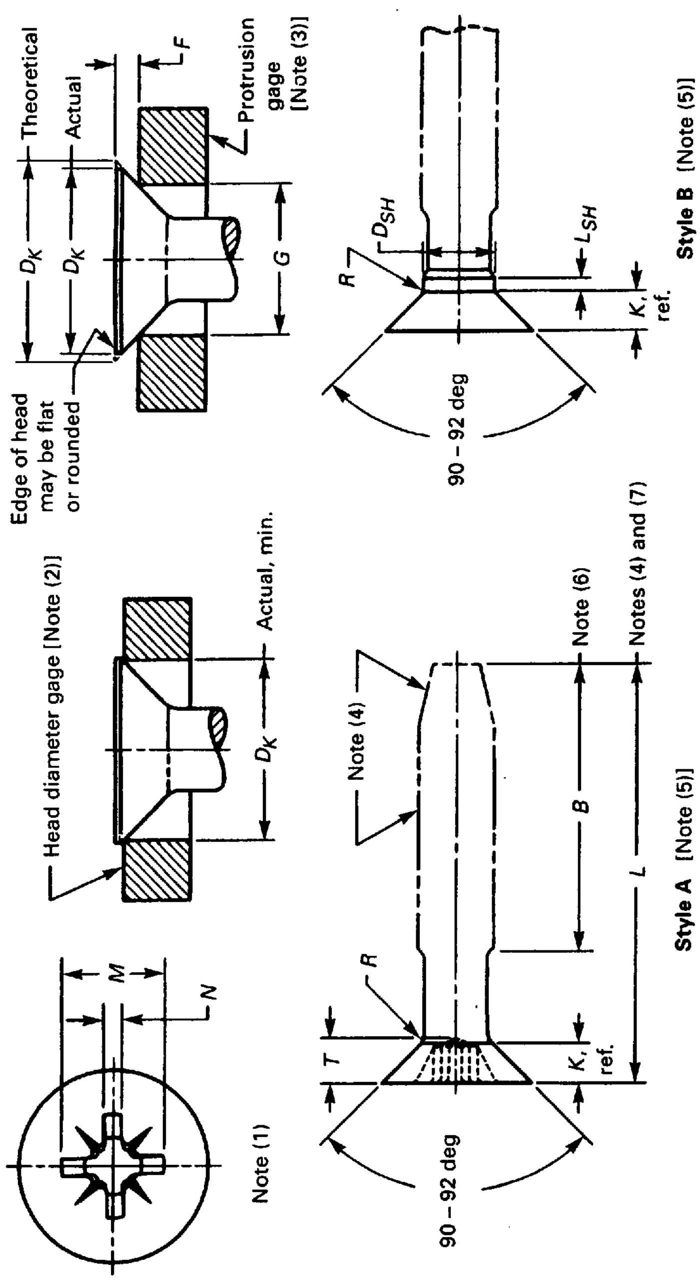


TABLE 10 ILLUSTRATION

TABLE 10 DIMENSIONS OF TYPE IA CROSS-RECESSED FLAT COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Shoulder Diameter, D_{SH}		Actual Head Diameter, D_K [Note (2)]		Max. Head Height, K,	Shoulder Length, L_{SH}		Underhead Fillet Radius, R		Recess Diameter, M,	Recess Depth, T,	Recess Width, N,	Driver Size	Recess Penetration Gaging Depth		Head Protrusion Above Gage Diameter, F [Note (3)]		Protrusion Gage Diameter, G
	Max.	Min.	Max.	Min.	Reference	Max.	Min.	Max.	Min.	Reference	Reference	Reference		Max.	Min.	Max.	Min.	[Note (3)]
Types AB, B, BF, and BT [Note (4)]																		
2.2 × 0.8	...	...	3.8	3.5	1.1	...	...	0.8	0.4	2.20	1.56	0.47	0	1.55	1.20	0.79	0.62	2.82
2.9 × 1	...	...	5.5	5.2	1.7	...	...	1.2	0.6	3.08	2.08	0.73	1	2.00	1.60	0.83	0.60	4.65
3.5 × 1.3	...	...	7.3	6.9	2.3	...	...	1.4	0.7	4.14	2.38	1.03	2	2.20	1.75	1.32	1.03	5.57
4.2 × 1.4	...	...	8.4	8.0	2.6	...	...	1.6	0.8	4.44	2.68	1.03	2	2.50	2.05	1.46	1.17	6.48
4.8 × 1.6	...	...	9.3	8.9	2.8	...	...	2.0	1.0	4.98	3.24	1.04	2	3.05	2.60	1.05	0.72	8.31
5.5 × 1.8	...	...	10.3	9.9	3.0	...	...	2.2	1.1	6.40	3.54	1.43	3	3.20	2.75	1.14	0.81	9.23
6.3 × 1.8	...	...	11.3	10.9	3.1	...	...	2.4	1.2	6.66	3.78	1.44	3	3.45	3.00	1.23	0.85	10.14
8 × 2.1	...	...	15.8	15.4	4.6	...	...	3.2	1.6	8.82	5.06	2.18	4	4.60	4.15	1.75	1.30	13.80
9.5 × 2.1	...	...	18.3	17.8	5.2	...	...	4.0	2.0	9.84	6.12	2.19	4	5.65	5.20	2.23	1.77	15.54
Types D, F, and T [Note (4)]																		
2 × 0.4	2.00	1.86	3.8	3.5	1.2	0.50	0.30	0.8	0.4	2.20	1.56	0.47	0	1.55	1.20	0.79	0.62	2.82
2.5 × 0.45	2.50	2.36	4.7	4.4	1.5	0.55	0.35	1.0	0.5	2.78	1.83	0.73	1	1.75	1.35	0.88	0.66	3.74
3 × 0.5	3.00	2.86	5.5	5.2	1.7	0.60	0.40	1.2	0.6	3.08	2.08	0.73	1	2.00	1.60	0.83	0.60	4.65
3.5 × 0.6	3.50	3.32	7.3	6.9	2.3	0.70	0.50	1.4	0.7	4.14	2.38	1.03	2	2.20	1.75	1.32	1.03	5.57
4 × 0.7	4.00	3.82	8.4	8.0	2.7	0.80	0.60	1.6	0.8	4.44	2.68	1.03	2	2.50	2.05	1.46	1.17	6.48
5 × 0.8	5.00	4.82	9.3	8.9	2.7	0.90	0.70	2.0	1.0	4.98	3.24	1.04	2	3.05	2.60	1.05	0.72	8.31
6 × 1	6.00	5.82	11.3	10.9	3.3	1.10	0.90	2.4	1.2	6.66	3.78	1.44	3	3.45	3.00	1.23	0.85	10.14
8 × 1.25	8.00	7.78	15.8	15.4	4.6	1.40	1.10	3.2	1.6	8.82	5.06	2.18	4	4.60	4.15	1.75	1.30	13.80
10 × 1.5	10.00	9.78	18.3	17.8	5.0	1.70	1.30	4.0	2.0	9.84	6.12	2.19	4	5.65	5.20	2.23	1.77	15.54

GENERAL NOTES:
(a) For reference, see Table 10 illustration beginning on page 16.
(b) The comparable ISO standard is ISO 7050.
(c) For additional requirements refer to section 2, titled General Data.
(d) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a large center opening, wide straight wings, and a blunt bottom, with all edges relieved or rounded.
(2) Acceptability of minimum head diameter shall be determined using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(3) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly and the proper protrusion values must be recalculated using the formulas shown in Appendix I.
(4) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(5) Recessed head Types D, F, and T tapping screws shall have Style B head form. Recessed head Types AB, B, BF, and BT tapping screws shall have Style A head form. The underhead shoulder is mandatory on Style B head form, and all other head dimensions shall be common for both the Style A and Style B head forms.
(6) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(7) See Table 22 for recommended tapping screw nominal lengths.

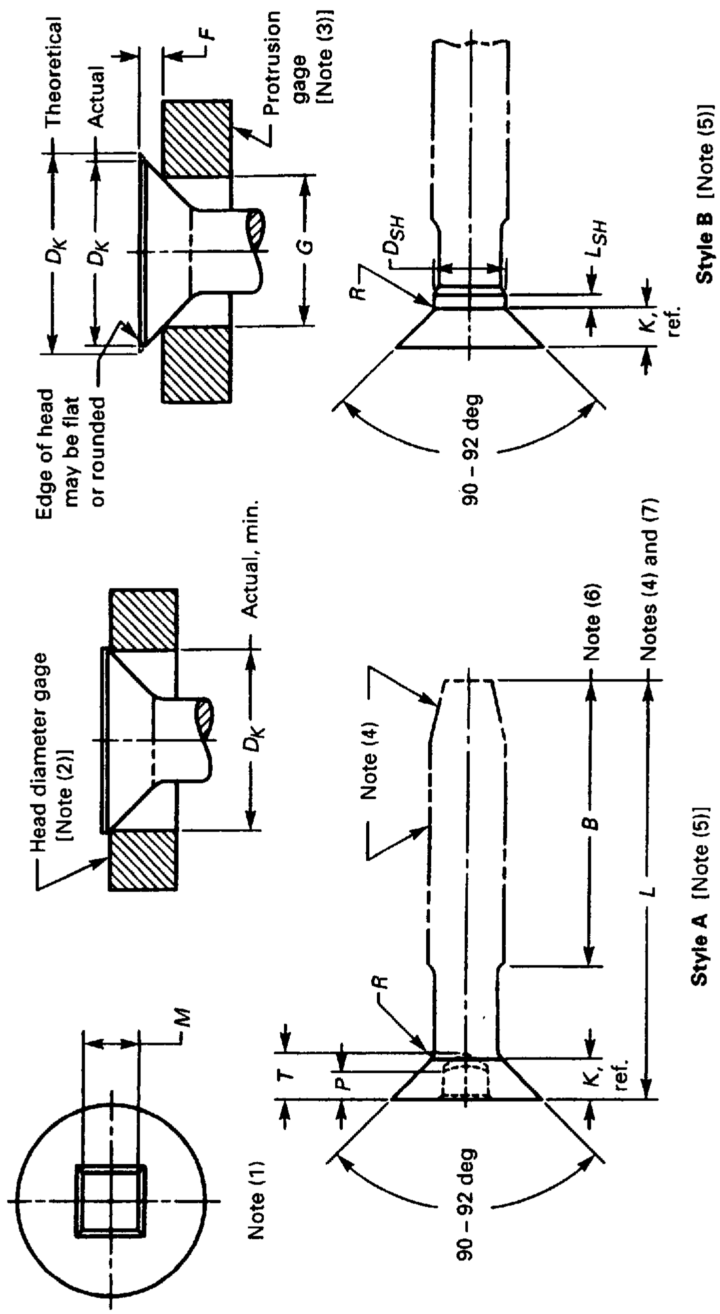


TABLE 11 ILLUSTRATION

TABLE 11 DIMENSIONS OF TYPE III SQUARE-RECESSED FLAT COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Shoulder Diameter, D_{SH}		Actual Head Diameter, D_K [Note (2)]		Max. Head Height, K, Reference	Shoulder Length, L_{SH}		Underhead Fillet Radius, R		Recess Across Flats, M, Reference	Recess Depth, T, Reference	Driver Size [Note (8)]	Recess Penetration Gaging Depth, P		Head Protrusion Above Gage Diameter, F [Note (3)]		Protrusion Gage Diameter, G [Note (3)]
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.				Max.	Min.	Max.	Min.	
For Types AB, B, BF, and BT [Note (4)]																	
2.9 × 1	...	...	5.5	5.2	1.7	...	...	1.2	0.6	1.78	1.68	0	0.97	0.71	0.83	0.60	4.65
3.5 × 1.3	...	...	7.3	6.9	2.3	...	...	1.4	0.7	2.31	2.44	1S	1.40	1.01	1.32	1.03	5.57
4.2 × 1.4	...	...	8.4	8.0	2.6	...	...	1.6	0.8	2.84	2.92	2S	1.61	1.21	1.46	1.17	6.48
4.8 × 1.6	...	...	9.3	8.9	2.8	...	...	2.0	1.0	2.84	3.23	2R	1.91	1.52	1.05	0.72	8.31
5.5 × 1.8	...	...	10.3	9.9	3.0	...	...	2.2	1.1	3.38	4.01	3R	2.42	2.03	1.14	0.81	9.23
6.3 × 1.8	...	...	11.3	10.9	3.1	...	...	2.4	1.2	3.38	4.01	3R	2.42	2.03	1.23	0.85	10.14
8 × 2.1	...	...	15.8	15.4	4.6	...	...	3.2	1.6	4.85	4.93	4R	2.54	2.15	1.75	1.30	13.80
9.5 × 2.1	...	...	18.3	17.8	5.2	...	...	4.0	2.0	4.85	4.93	4R	2.54	2.15	2.23	1.77	15.54
Types D, F, and T [Note (4)]																	
2.5 × 0.45	2.50	2.36	4.7	4.4	1.5	0.55	0.35	1.0	0.5	1.78	1.68	0	0.97	0.71	0.88	0.66	3.74
3 × 0.5	3.00	2.86	5.5	5.2	1.7	0.60	0.40	1.2	0.6	1.78	1.68	0	0.97	0.71	0.83	0.60	4.65
3.5 × 0.6	3.50	3.32	7.3	6.9	2.3	0.70	0.50	1.4	0.7	2.31	2.44	1S	1.40	1.01	1.32	1.03	5.57
4 × 0.7	4.00	3.82	8.4	8.0	2.7	0.80	0.60	1.6	0.8	2.84	2.92	2S	1.61	1.21	1.46	1.17	6.48
5 × 0.8	5.00	4.82	9.3	8.9	2.7	0.90	0.70	2.0	1.0	2.84	3.23	2R	1.91	1.52	1.05	0.72	8.31
6 × 1	6.00	5.82	11.3	10.9	3.3	1.10	0.90	2.4	1.2	3.38	4.01	3R	2.42	2.03	1.23	0.85	10.14
8 × 1.25	8.00	7.78	15.8	15.4	4.6	1.40	1.10	3.2	1.6	4.85	4.93	4R	2.54	2.15	1.75	1.30	13.80
10 × 1.5	10.00	9.78	18.3	17.8	5.0	1.70	1.30	4.0	2.0	4.85	4.93	4R	2.54	2.15	2.23	1.77	15.54

GENERAL NOTES:
(a) For reference, see Table 11 illustration beginning on page 18.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a square center opening, slightly tapered side walls, and a conical bottom, with top edges relieved or rounded.
(2) Acceptability of minimum head diameter shall be determined using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(3) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly and the proper protrusion values must be recalculated using the formulas shown in Appendix I.
(4) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(5) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(6) See Table 22 for recommended tapping screw nominal lengths.
(7) Recessed head Types D, F, and T tapping screws shall have Style B head form. Recessed head Types AB, B, BF, and BT tapping screws shall have Style A head form. The underhead shoulder is mandatory on Style B head form, and all other head dimensions shall be common for both the Style A and Style B head forms.
(8) S = short; R = regular

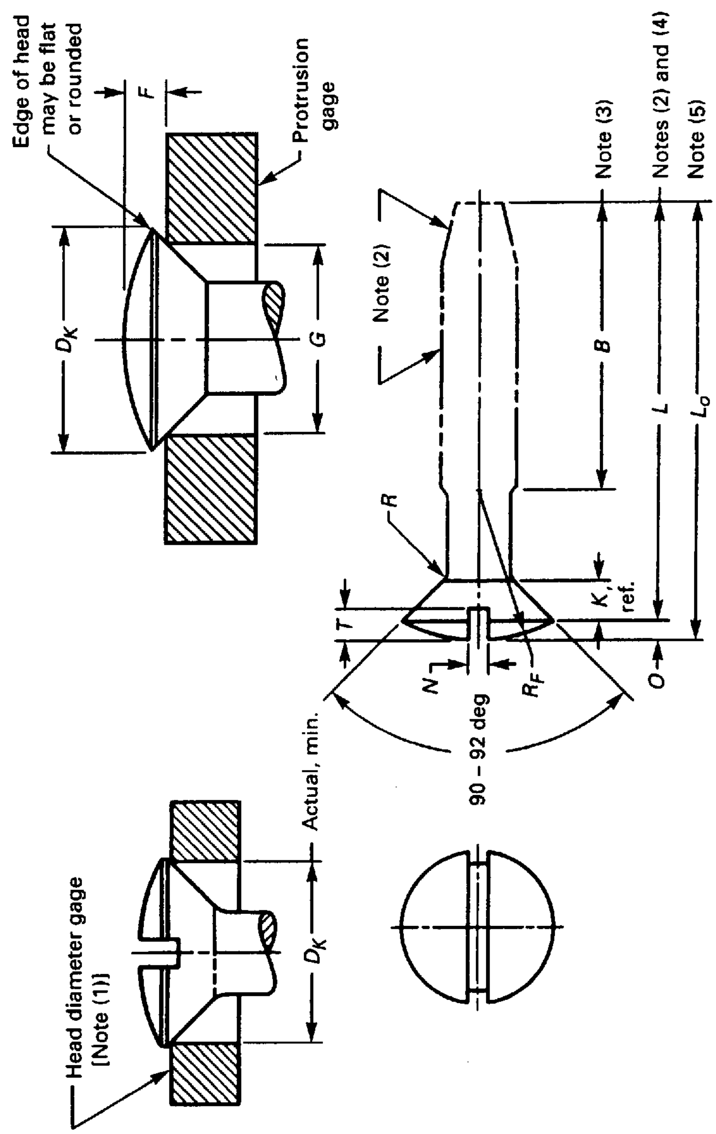


TABLE 12 ILLUSTRATION

TABLE 12 DIMENSIONS OF SLOTTED OVAL COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Actual Head Diameter, D_K [Note (1)]		Max. Head Side Height, K, Reference	Max. Raised Head Height, O	Approximate Head Top Radius, R_F	Underhead Fillet Radius, R		Slot Width, N		Slot Depth, T		Head Protrusion Above Gage Diameter, F [Note (6)]		Protrusion Gage Diameter, G [Note (6)]
	Max.	Min.				Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
Types AB, B, BF, and BT [Note (2)]														
2.2 × 0.8	3.8	3.5	1.1	0.5	5.0	0.8	0.4	0.7	0.5	1.0	0.8	1.29	1.12	2.82
2.9 × 1	5.5	5.2	1.7	0.7	7.4	1.2	0.6	1.0	0.8	1.5	1.2	1.53	1.30	4.65
3.5 × 1.3	7.3	6.9	2.3	0.8	10.9	1.4	0.7	1.2	1.0	1.7	1.4	2.12	1.83	5.57
4.2 × 1.4	8.4	8.0	2.6	1.0	11.6	1.6	0.8	1.5	1.2	1.9	1.6	2.46	2.17	6.48
4.8 × 1.6	9.3	8.9	2.8	1.2	11.9	2.0	1.0	1.5	1.2	2.4	2.0	2.25	1.92	8.31
5.5 × 1.8	10.3	9.9	3.0	1.3	13.4	2.2	1.1	1.9	1.6	2.6	2.2	2.44	2.11	9.23
6.3 × 1.8	11.3	10.9	3.1	1.4	14.9	2.4	1.2	1.9	1.6	2.8	2.4	2.63	2.25	10.14
8 × 2.1	15.8	15.4	4.6	2.0	19.7	3.2	1.6	2.3	2.0	3.7	3.2	3.75	3.30	13.80
9.5 × 2.1	18.3	17.8	5.2	2.3	22.9	4.0	2.0	2.8	2.5	4.4	3.8	4.53	4.07	15.54
Types D, F, and T [Note (2)]														
2 × 0.4	3.8	3.5	1.2	0.5	5.0	0.8	0.4	0.7	0.5	1.0	0.8	1.29	1.12	2.82
2.5 × 0.45	4.7	4.4	1.5	0.6	6.6	1.0	0.5	0.8	0.6	1.2	1.0	1.48	1.26	3.74
3 × 0.5	5.5	5.2	1.7	0.7	7.4	1.2	0.6	1.0	0.8	1.5	1.2	1.53	1.30	4.65
3.5 × 0.6	7.3	6.9	2.3	0.8	10.9	1.4	0.7	1.2	1.0	1.7	1.4	2.12	1.83	5.57
4 × 0.7	8.4	8.0	2.7	1.0	11.6	1.6	0.8	1.5	1.2	1.9	1.6	2.46	2.17	6.48
5 × 0.8	9.3	8.9	2.7	1.2	11.9	2.0	1.0	1.5	1.2	2.4	2.0	2.25	1.92	8.31
6 × 1	11.3	10.9	3.3	1.4	14.9	2.4	1.2	1.9	1.6	2.8	2.4	2.63	2.25	10.14
8 × 1.25	15.8	15.4	4.6	2.0	19.7	3.2	1.6	2.3	2.0	3.7	3.2	3.75	3.30	13.80
10 × 1.5	18.3	17.8	5.0	2.3	22.9	4.0	2.0	2.8	2.5	4.4	3.8	4.53	4.07	15.54

GENERAL NOTES:
(a) For reference, see Table 12 illustration beginning on page 20.
(b) For additional requirements refer to section 2, titled General Data.
(c) The comparable ISO standard is ISO 1483.
(d) Dimensions are in millimeters.

NOTES:
(1) Acceptability of minimum head diameter shall be determined using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(2) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(3) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(4) See para. 2.2.
(5) See Table 22 for recommended tapping screw nominal lengths.
(6) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly, and the proper protrusion values must be recalculated using the formulas shown in Appendix I.

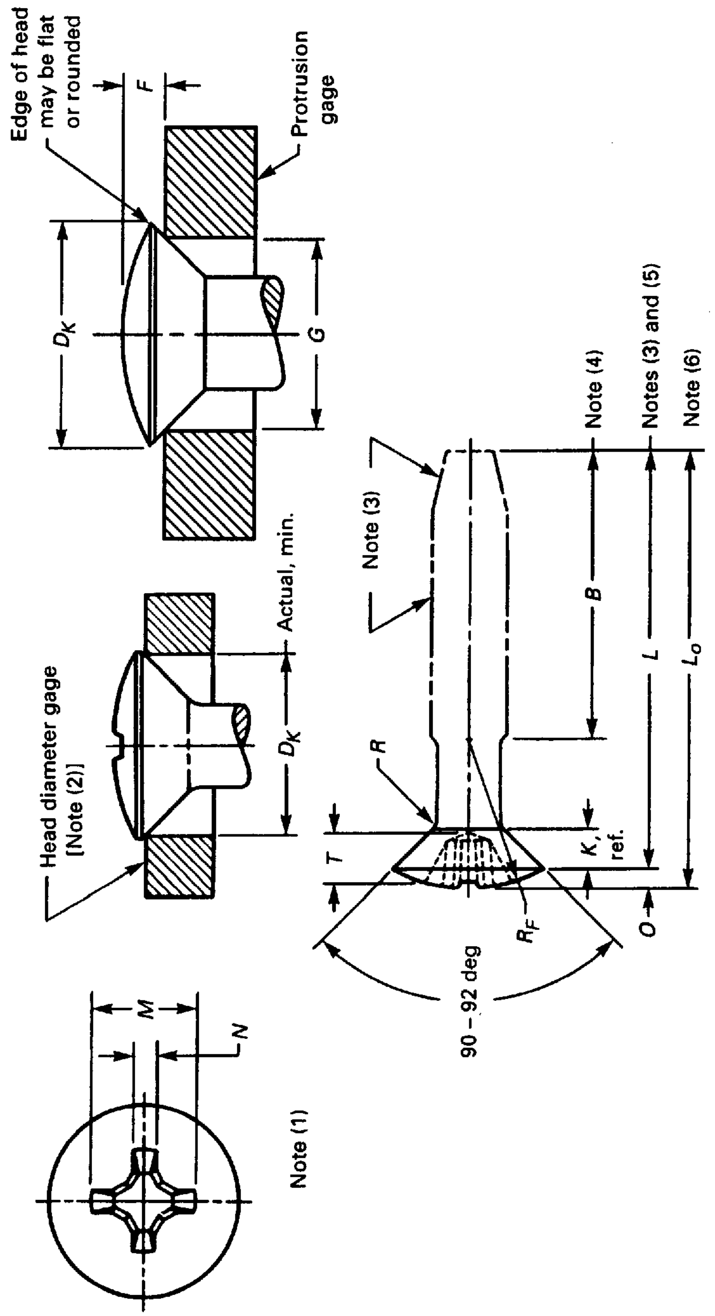


TABLE 13 ILLUSTRATION

TABLE 13 DIMENSIONS OF TYPE I CROSS-RECESSED OVAL COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Actual Head Diameter, D_K [Note (2)]		Max. Head Side Height, K, Reference	Max. Raised Head Height, O	Approximate Head Top Radius, R_F	Underhead Fillet Radius, R		Recess Diameter, M, Reference	Recess Depth, T, Reference	Recess Width, N, Reference	Driver Size	Recess Penetration Gaging Depth, P		Head Protrusion Above Gage Diameter, F [Note (7)]		Protrusion Gage Diameter, G [Note (7)]
	Max.	Min.				Max.	Min.					Max.	Min.	Max.	Min.	
Types AB, B, BF, and BT [Note (3)]																
2.2 × 0.8	3.8	3.5	1.1	0.5	5.0	0.8	0.4	2.36	1.69	0.56	0	1.70	1.40	1.29	1.12	2.82
2.9 × 1	5.5	5.2	1.7	0.7	7.4	1.2	0.6	3.44	2.33	0.83	1	2.43	2.03	1.53	1.30	4.65
3.5 × 1.3	7.3	6.9	2.3	0.8	10.9	1.4	0.7	4.38	2.48	0.94	2	2.43	1.93	2.12	1.83	5.57
4.2 × 1.4	8.4	8.0	2.6	1.0	11.6	1.6	0.8	4.92	2.99	1.01	2	2.98	2.48	2.46	2.17	6.48
4.8 × 1.6	9.3	8.9	2.8	1.2	11.9	2.0	1.0	5.66	3.74	1.10	2	3.69	3.19	2.25	1.92	8.31
5.5 × 1.8	10.3	9.9	3.0	1.3	13.4	2.2	1.1	6.92	3.84	1.14	3	3.63	3.13	2.44	2.11	9.23
6.3 × 1.8	11.3	10.9	3.1	1.4	14.9	2.4	1.2	7.30	4.26	1.19	3	4.05	3.55	2.63	2.25	10.14
8 × 2.1	15.8	15.4	4.6	2.0	19.7	3.2	1.6	9.86	5.81	1.95	4	5.53	4.93	3.75	3.30	13.80
9.5 × 2.1	18.3	17.8	5.2	2.3	22.9	4.0	2.0	11.24	7.15	2.17	4	6.87	6.27	4.53	4.07	15.54
Types D, F, and T [Note (3)]																
2 × 0.4	3.8	3.5	1.2	0.5	5.0	0.8	0.4	2.36	1.69	0.56	0	1.70	1.40	1.29	1.12	2.82
2.5 × 0.45	4.7	4.4	1.5	0.6	6.6	1.0	0.5	3.06	1.95	0.77	1	1.96	1.56	1.48	1.26	3.74
3 × 0.5	5.5	5.2	1.7	0.7	7.4	1.2	0.6	3.44	2.33	0.83	1	2.43	2.03	1.53	1.30	4.65
3.5 × 0.6	7.3	6.9	2.3	0.8	10.9	1.4	0.7	4.38	2.48	0.94	2	2.43	1.93	2.12	1.83	5.57
4 × 0.7	8.4	8.0	2.7	1.0	11.6	1.6	0.8	4.92	2.99	1.01	2	2.98	2.48	2.46	2.17	6.48
5 × 0.8	9.3	8.9	2.7	1.2	11.9	2.0	1.0	5.66	3.74	1.10	2	3.69	3.19	2.25	1.92	8.31
6 × 1	11.3	10.9	3.3	1.4	14.9	2.4	1.2	7.30	4.26	1.19	3	4.05	3.55	2.63	2.25	10.14
8 × 1.25	15.8	15.4	4.6	2.0	19.7	3.2	1.6	9.86	5.81	1.95	4	5.53	4.93	3.75	3.30	13.80
10 × 1.5	18.3	17.8	5.0	2.3	22.9	4.0	2.0	11.24	7.15	2.17	4	6.87	6.27	4.53	4.07	15.54

GENERAL NOTES:
(a) For reference, see Table 13 illustration beginning on page 22.
(b) The comparable ISO standard is ISO 7051.
(c) For additional requirements refer to section 2, titled General Data.
(d) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a large center opening, tapered wings, and a blunt bottom, with all edges relieved or rounded.
(2) Acceptability of minimum head diameter shall be determined using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(3) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(4) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(5) See Table 22 for recommended tapping screw nominal lengths.
(6) See para. 2.2.
(7) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly, and the proper protrusion values must be recalculated using the formulas shown in Appendix I.

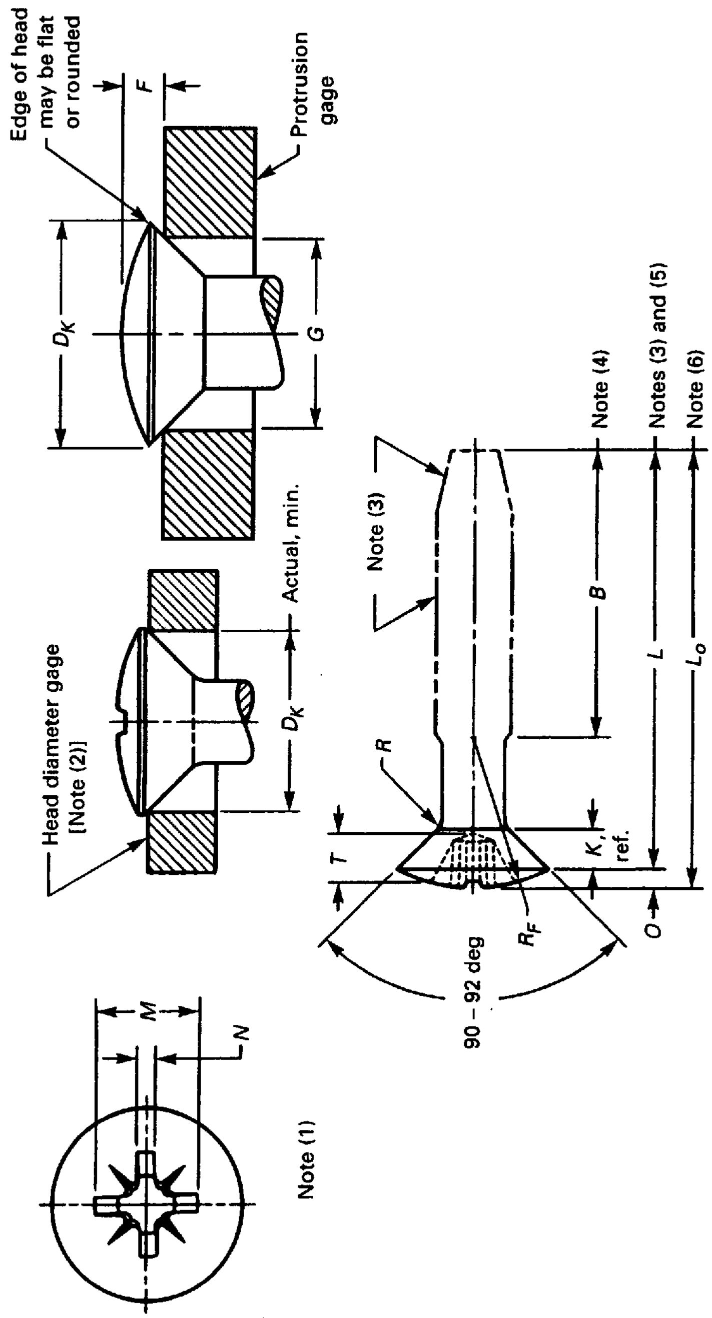


TABLE 14 ILLUSTRATION

TABLE 14 DIMENSIONS OF TYPE IA CROSS-RECESSED OVAL COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Actual Head Diameter, D_K [Note (2)]		Max. Head Side Height, K, Reference	Max. Raised Head Height, O	Approximate Head Top Radius, R_F	Underhead Fillet Radius, R		Recess Diameter, M, Reference	Recess Depth, T, Reference	Recess Width, N, Reference	Driver Size	Recess Penetration Gaging Depth, P		Head Protrusion Above Gage Diameter, F [Note (7)]		Protrusion Gage Diameter, G [Note (7)]
	Max.	Min.				Max.	Min.					Max.	Min.	Max.	Min.	
Types AB, B, BF, and BT [Note (3)]																
2.2 × 0.8	3.8	3.5	1.1	0.5	5.0	0.8	0.4	2.40	1.72	0.48	0	1.72	1.37	1.29	1.12	2.82
2.9 × 1	5.5	5.2	1.7	0.7	7.4	1.2	0.6	2.98	2.31	0.74	1	2.32	1.92	1.53	1.30	4.65
3.5 × 1.3	7.3	6.9	2.3	0.8	10.9	1.4	0.7	4.46	2.66	1.03	2	2.48	2.03	2.12	1.83	5.57
4.2 × 1.4	8.4	8.0	2.6	1.0	11.6	1.6	0.8	4.90	3.10	1.04	2	2.93	2.48	2.46	2.17	6.48
4.8 × 1.6	9.3	8.9	2.8	1.2	11.9	2.0	1.0	5.58	3.78	1.05	2	3.60	3.15	2.25	1.92	8.31
5.5 × 1.8	10.3	9.9	3.0	1.3	13.4	2.2	1.1	6.98	4.06	1.44	3	3.72	3.27	2.44	2.11	9.23
6.3 × 1.8	11.3	10.9	3.1	1.4	14.9	2.4	1.2	7.32	4.38	1.45	3	4.05	3.60	2.63	2.25	10.14
8 × 2.1	15.8	15.4	4.6	2.0	19.7	3.2	1.6	9.90	6.08	2.19	4	5.62	5.17	3.75	3.30	13.80
9.5 × 2.1	18.3	17.8	5.2	2.3	22.9	4.0	2.0	11.18	7.38	2.20	4	6.92	6.47	4.53	4.07	15.54
Types D, F, and T [Note (3)]																
2 × 0.4	3.8	3.5	1.2	0.5	5.0	0.8	0.4	2.40	1.72	0.48	0	1.72	1.37	1.29	1.12	2.82
2.5 × 0.45	4.7	4.4	1.5	0.6	6.6	1.0	0.5	2.62	1.94	0.73	1	1.98	1.58	1.48	1.26	3.74
3 × 0.5	5.5	5.2	1.7	0.7	7.4	1.2	0.6	2.98	2.31	0.74	1	2.32	1.92	1.53	1.30	4.65
3.5 × 0.6	7.3	6.9	2.3	0.8	10.9	1.4	0.7	4.46	2.66	1.03	2	2.48	2.03	2.12	1.83	5.57
4 × 0.7	8.4	8.0	2.7	1.0	11.6	1.6	0.8	4.90	3.10	1.04	2	2.93	2.48	2.46	2.17	6.48
5 × 0.8	9.3	8.9	2.7	1.2	11.9	2.0	1.0	5.58	3.78	1.05	2	3.60	3.15	2.25	1.92	8.31
6 × 1	11.3	10.9	3.3	1.4	14.9	2.4	1.2	7.32	4.38	1.45	3	4.05	3.60	2.63	2.25	10.14
8 × 1.25	15.8	15.4	4.6	2.0	19.7	3.2	1.6	9.90	6.08	2.19	4	5.62	5.17	3.75	3.30	13.80
10 × 1.5	18.3	17.8	5.0	2.3	22.9	4.0	2.0	11.18	7.38	2.20	4	6.92	6.47	4.53	4.07	15.54

GENERAL NOTES:
(a) For reference, see Table 14 illustration beginning on page 24.
(b) The comparable ISO standard is ISO 7051.
(c) For additional requirements refer to section 2, titled General Data.
(d) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a large center opening, wide straight wings, and a blunt bottom, with all edges relieved or rounded.
(2) Acceptability of minimum head diameter shall be determined by using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(3) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths aplicable to the respective screw types.
(4) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(5) See Table 22 for recommended tapping screw nominal lengths.
(6) See para. 2.2.
(7) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly, and the proper protrusion values must be recalculated using the formulas shown in Appendix I.

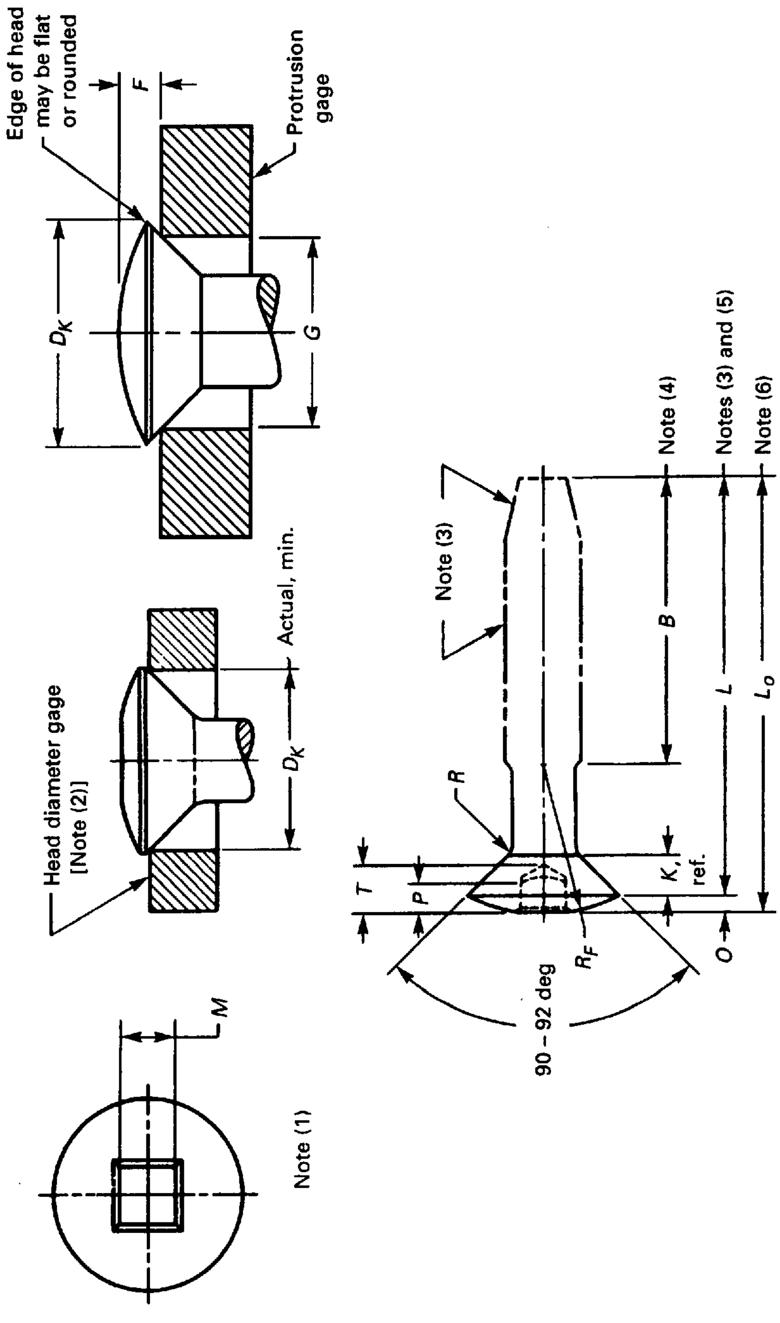


TABLE 15 ILLUSTRATION

TABLE 15 DIMENSIONS OF TYPE III SQUARE-RECESSED OVAL COUNTERSUNK HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Actual Head Diameter, D_K [Note (2)]		Max. Head Side Height, K, Reference	Max. Raised Head Height, O	Approximate Head Top Radius, R_F	Underhead Fillet Radius, R		Recess Across Flats, M, Reference	Recess Depth, T, Reference	Driver Size [Note (7)]	Recess Penetration Gaging Depth, P		Head Protrusion Above Gage Diameter, F [Note (8)]		Protrusion Gage Diameter, G [Note (8)]
	Max.	Min.				Max.	Min.				Max.	Min.	Max.	Min.	
Types AB, B, BF, and BT [Note (3)]															
2.9 × 1	5.5	5.2	1.7	0.7	7.4	1.2	0.6	1.78	1.68	0	0.97	0.71	1.53	1.30	4.65
3.5 × 1.3	7.3	6.9	2.3	0.8	10.9	1.4	0.7	2.31	2.69	1R	1.66	1.27	2.12	1.83	5.57
4.2 × 1.4	8.4	8.0	2.6	1.0	11.6	1.6	0.8	2.84	3.23	2R	1.91	1.52	2.46	2.17	6.48
4.8 × 1.6	9.3	8.9	2.8	1.2	11.9	2.0	1.0	2.84	3.23	2R	1.91	1.52	2.25	1.92	8.31
5.5 × 1.8	10.3	9.9	3.0	1.3	13.4	2.2	1.1	3.38	4.01	3R	2.42	2.03	2.44	2.11	9.23
6.3 × 1.8	11.3	10.9	3.1	1.4	14.9	2.4	1.2	3.38	4.01	3R	2.42	2.03	2.63	2.25	10.14
8 × 2.1	15.8	15.4	4.6	2.0	19.7	3.2	1.6	4.85	4.93	4R	2.54	2.15	3.75	3.30	13.80
9.5 × 2.1	18.3	17.8	5.2	2.3	22.9	4.0	2.0	4.85	4.93	4R	2.54	2.15	4.53	4.07	15.54
Types D, F, and T [Note (3)]															
2.5 × 0.45	4.7	4.4	1.5	0.6	6.6	1.0	0.5	1.78	1.68	0	0.97	0.71	1.48	1.26	3.74
3 × 0.5	5.5	5.2	1.7	0.7	7.4	1.2	0.6	1.78	1.68	0	0.97	0.71	1.53	1.30	4.65
3.5 × 0.6	7.3	6.9	2.3	0.8	10.9	1.4	0.7	2.31	2.69	1R	1.66	1.27	2.12	1.83	5.57
4 × 0.7	8.4	8.0	2.7	1.0	11.6	1.6	0.8	2.84	3.23	2R	1.91	1.52	2.46	2.17	6.48
5 × 0.8	9.3	8.9	2.7	1.2	11.9	2.0	1.0	2.84	3.23	2R	1.91	1.52	2.25	1.92	8.31
6 × 1	11.3	10.9	3.3	1.4	14.9	2.4	1.2	3.38	4.01	3R	2.42	2.03	2.63	2.25	10.14
8 × 1.25	15.8	15.4	4.6	2.0	19.7	3.2	1.6	4.85	4.93	4R	2.54	2.15	3.75	3.30	13.80
10 × 1.5	18.3	17.8	5.0	2.3	22.9	4.0	2.0	4.85	4.93	4R	2.54	2.15	4.53	4.07	15.54

GENERAL NOTES:
(a) For reference, see Table 15 illustration beginning on page 26.
(b) There is no ISO standard covering Type III square-recessed raised countersunk head tapping screws.
(c) For additional requirements refer to section 2, titled General Data.
(d) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a square center opening, slightly tapered side walls, and a conical bottom, with top edges relieved or rounded.
(2) Acceptability of minimum head diameter shall be determined by using a plain ring gage having a hole diameter equal to the specified D_K actual minimum limit within a tolerance of +0.00, −0.01 mm. The head shall not enter the gage.
(3) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(4) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(5) See Table 22 for recommended tapping screw nominal lengths.
(6) See para. 2.2.
(7) R = Regular
(8) No tolerance for gage diameter is given. If the gage diameter of the gage used differs from the tabulated value, the protrusion will be affected accordingly and the proper protrusion values must be recalculated using the formulas shown in Appendix I.

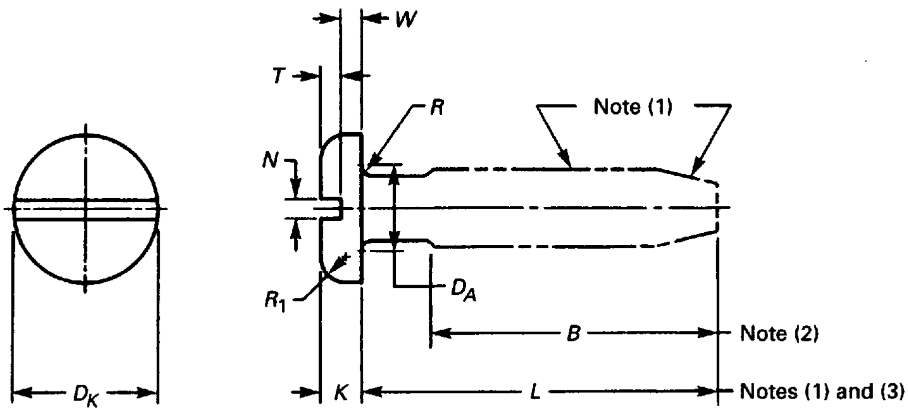
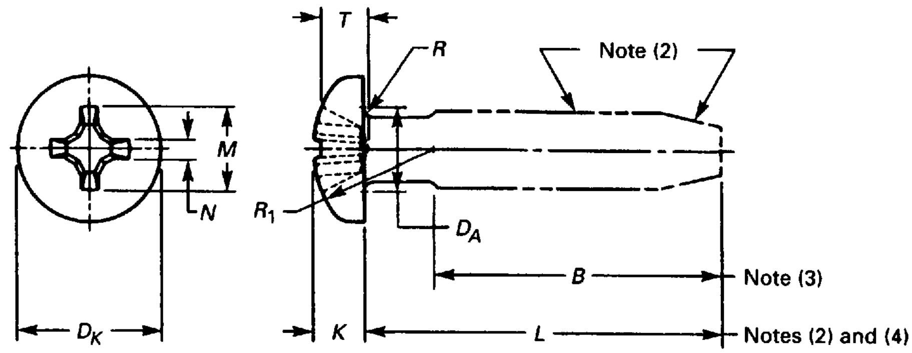


TABLE 16 DIMENSIONS OF SLOTTED PAN HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Head Diameter, D_K Max.	Head Diameter, D_K Min.	Head Height, K Max.	Head Height, K Min.	Max. Head Radius, R_1	Underhead Fillet: Max. Transition Diameter, D_A	Underhead Fillet: Min. Radius, R	Slot Width, N Max.	Slot Width, N Min.	Min. Slot Depth, T	Min. Unslotted Head Thickness, W
Types AB, B, BF, and BT [Note (1)]											
2.2 × 0.8	4.0	3.7	1.3	1.1	0.8	2.8	0.1	0.7	0.5	0.5	0.5
2.9 × 1	5.6	5.3	1.8	1.6	1.2	3.5	0.1	1.0	0.8	0.7	0.7
3.5 × 1.3	7.0	6.6	2.1	1.9	1.4	4.1	0.1	1.2	1.0	0.8	0.8
4.2 × 1.4	8.0	7.6	2.4	2.2	1.6	4.9	0.2	1.5	1.2	1.0	0.9
4.8 × 1.6	9.5	9.1	3.0	2.7	2.0	5.5	0.2	1.5	1.2	1.2	1.2
5.5 × 1.8	11.0	10.5	3.2	2.9	2.2	6.3	0.2	1.9	1.6	1.3	1.3
6.3 × 1.8	12.0	11.5	3.6	3.3	2.5	7.1	0.3	1.9	1.6	1.4	1.4
8 × 2.1	16.0	15.5	4.8	4.5	3.2	9.2	0.4	2.3	2.0	1.9	1.9
9.5 × 2.1	20.0	19.4	6.0	5.7	4.0	10.7	0.4	2.8	2.5	2.4	2.4
Types D, F, and T [Note (1)]											
2 × 0.4	4.0	3.7	1.3	1.1	0.8	2.6	0.1	0.7	0.5	0.5	0.5
2.5 × 0.45	5.0	4.7	1.5	1.3	1.0	3.1	0.1	0.8	0.6	0.6	0.6
3 × 0.5	5.6	5.3	1.8	1.6	1.2	3.6	0.1	1.0	0.8	0.7	0.7
3.5 × 0.6	7.0	6.6	2.1	1.9	1.4	4.1	0.1	1.2	1.0	0.8	0.8
4 × 0.7	8.0	7.6	2.4	2.2	1.6	4.7	0.2	1.5	1.2	1.0	0.9
5 × 0.8	9.5	9.1	3.0	2.7	2.0	5.7	0.2	1.5	1.2	1.2	1.2
6 × 1	12.0	11.5	3.6	3.3	2.5	6.8	0.3	1.9	1.6	1.4	1.4
8 × 1.25	16.0	15.5	4.8	4.5	3.2	9.2	0.4	2.3	2.0	1.9	1.9
10 × 1.5	20.0	19.4	6.0	5.7	4.0	11.2	0.4	2.8	2.5	2.4	2.4

GENERAL NOTES:
(a) The comparable ISO standard is ISO 1481.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

NOTES:
(1) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(2) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(3) See Table 22 for recommended tapping screw nominal lengths.



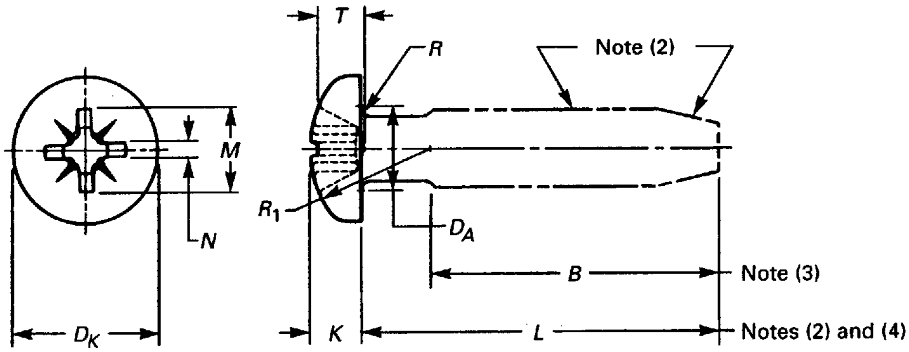
Note (1)

TABLE 17 DIMENSIONS OF TYPE I CROSS-RECESSED PAN HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Head Diameter, D_K Max.	Head Diameter, D_K Min.	Head Height, K Max.	Head Height, K Min.	Head Radius, R_1, Reference	Underhead Fillet Max. Transition Diameter, D_A	Underhead Fillet Min. Radius, R	Recess Diameter, M, Reference	Recess Depth, T, Reference	Recess Width, N, Reference	Driver Size	Recess Penetration Gaging Depth, P Max.	Recess Penetration Gaging Depth, P Min.
Types AB, B, BF, and BT [Note (2)]													
2.2 × 0.8	4.0	3.7	1.6	1.4	3.2	2.8	0.1	1.82	1.19	0.48	0	1.20	0.95
2.9 × 1	5.6	5.3	2.4	2.2	5.0	3.5	0.1	2.90	1.76	0.74	1	1.80	1.40
3.5 × 1.3	7.0	6.6	2.6	2.3	6.0	4.1	0.1	3.92	1.95	0.87	2	1.90	1.40
4.2 × 1.4	8.0	7.6	3.1	2.8	6.5	4.9	0.2	4.40	2.45	0.93	2	2.40	1.90
4.8 × 1.6	9.5	9.1	3.7	3.4	8.0	5.5	0.2	4.90	2.95	1.00	2	2.90	2.40
5.5 × 1.8	11.0	10.5	4.0	3.7	9.0	6.3	0.2	6.44	2.31	1.07	3	3.10	2.60
6.3 × 1.8	12.0	11.5	4.6	4.3	10.0	7.1	0.3	6.92	3.81	1.14	3	3.60	3.10
8 × 2.1	16.0	15.5	6.0	5.6	13.0	9.2	0.4	9.02	4.88	1.69	4	4.60	4.00
9.5 × 2.1	20.0	19.4	7.5	7.1	16.0	10.7	0.4	10.18	6.09	1.84	4	5.80	5.20
Types D, F, and T [Note (2)]													
2 × 0.4	4.0	3.7	1.6	1.4	3.2	2.6	0.1	1.82	1.19	0.48	0	1.20	0.95
2.5 × 0.45	5.0	4.7	2.1	1.9	4.0	3.1	0.1	2.68	1.53	0.70	1	1.55	1.15
3 × 0.5	5.6	5.3	2.4	2.2	5.0	3.6	0.1	2.90	1.76	0.74	1	1.80	1.40
3.5 × 0.6	7.0	6.6	2.6	2.3	6.0	4.1	0.1	3.92	1.95	0.87	2	1.90	1.40
4 × 0.7	8.0	7.6	3.1	2.8	6.5	4.7	0.2	4.40	2.45	0.93	2	2.40	1.90
5 × 0.8	9.5	9.1	3.7	3.4	8.0	5.7	0.2	4.90	2.95	1.00	2	2.90	2.40
6 × 1	12.0	11.5	4.6	4.3	10.0	6.8	0.3	6.92	3.81	1.14	3	3.60	3.10
8 × 1.25	16.0	15.5	6.0	5.6	13.0	9.2	0.4	9.02	4.88	1.69	4	4.60	4.00
10 × 1.5	20.0	19.4	7.5	7.1	16.0	11.2	0.4	10.18	6.09	1.84	4	5.80	5.20

GENERAL NOTES:
(a) The comparable ISO standard is ISO 7049.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a large center opening, tapered wings, and a blunt bottom, with all edges relieved or rounded.
(2) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(3) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(4) See Table 22 for recommended tapping screw nominal lengths.



Note (1)

TABLE 18 DIMENSIONS OF TYPE IA CROSS-RECESSED PAN HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Head Diameter, D_K Max.	Head Diameter, D_K Min.	Head Height, K Max.	Head Height, K Min.	Head Radius, R_1, Reference	Underhead Fillet Max. Transition Diameter, D_A	Underhead Fillet Min. Radius, R	Recess Diameter, M, Reference	Recess Depth, T, Reference	Recess Width, N, Reference	Driver Size	Recess Penetration Gaging Depth, P Max.	Recess Penetration Gaging Depth, P Min.
Types AB, B, BF, and BT [Note (2)]													
2.2 × 0.8	4.0	3.7	1.6	1.4	3.2	2.8	0.1	1.92	1.22	0.47	0	1.20	0.85
2.9 × 1	5.6	5.3	2.4	2.2	5.0	3.5	0.1	2.86	1.83	0.73	1	1.75	1.35
3.5 × 1.3	7.0	6.6	2.6	2.3	6.0	4.1	0.1	3.90	2.14	1.03	2	1.90	1.45
4.2 × 1.4	8.0	7.6	3.1	2.8	6.5	4.9	0.2	4.36	2.54	1.03	2	2.35	1.90
4.8 × 1.6	9.5	9.1	3.7	3.4	8.0	5.5	0.2	4.76	2.94	1.04	2	2.75	2.30
5.5 × 1.8	11.0	10.5	4.0	3.7	9.0	6.3	0.2	6.30	3.34	1.43	3	3.00	2.55
6.3 × 1.8	12.0	11.5	4.6	4.3	10.0	7.1	0.3	6.80	3.84	1.44	3	3.50	3.05
8 × 2.1	16.0	15.5	6.0	5.6	13.0	9.2	0.4	8.82	4.96	2.18	4	4.50	4.05
9.5 × 2.1	20.0	19.4	7.5	7.1	16.0	10.7	0.4	10.04	6.16	2.19	4	5.70	5.25
Types D, F, and T [Note (2)]													
2 × 0.4	4.0	3.7	1.6	1.4	3.2	2.6	0.1	1.92	1.22	0.47	0	1.20	0.85
2.5 × 0.45	5.0	4.7	2.1	1.9	4.0	3.1	0.1	2.62	1.58	0.73	1	1.50	1.10
3 × 0.5	5.6	5.3	2.4	2.2	5.0	3.6	0.1	2.86	1.83	0.73	1	1.75	1.35
3.5 × 0.6	7.0	6.6	2.6	2.3	6.0	4.1	0.1	3.90	2.14	1.03	2	1.90	1.45
4 × 0.7	8.0	7.6	3.1	2.8	6.5	4.7	0.2	4.36	2.54	1.03	2	2.35	1.90
5 × 0.8	9.5	9.1	3.7	3.4	8.0	5.7	0.2	4.76	2.94	1.04	2	2.75	2.30
6 × 1	12.0	11.5	4.6	4.3	10.0	6.8	0.3	6.80	3.84	1.44	3	3.50	3.05
8 × 1.25	16.0	15.5	6.0	5.6	13.0	9.2	0.4	8.82	4.96	2.18	4	4.50	4.05
10 × 1.5	20.0	19.4	7.5	7.1	16.0	11.2	0.4	10.04	6.16	2.19	4	5.70	5.25

GENERAL NOTES:
(a) The comparable ISO standard is ISO 7049.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a large center opening, wide straight wings, and a blunt bottom, with all edges relieved or rounded.
(2) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(3) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(4) See Table 22 for recommended tapping screw nominal lengths.

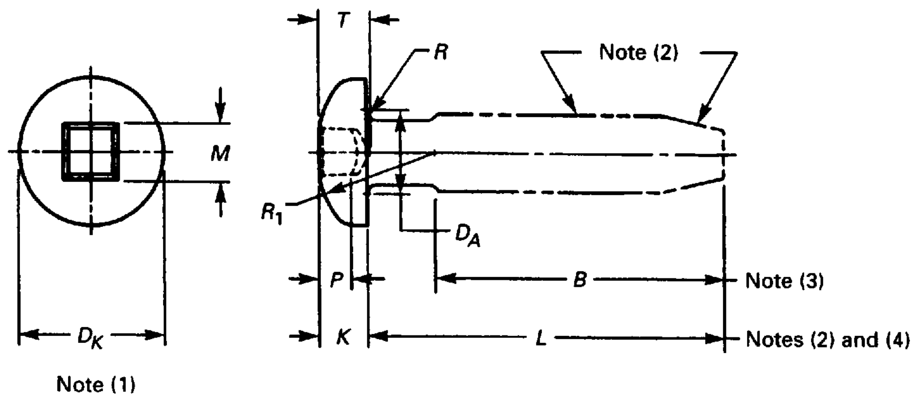
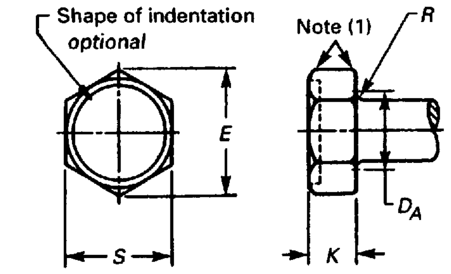


TABLE 19 DIMENSIONS OF TYPE III SQUARE-RECESSED PAN HEAD TAPPING SCREWS

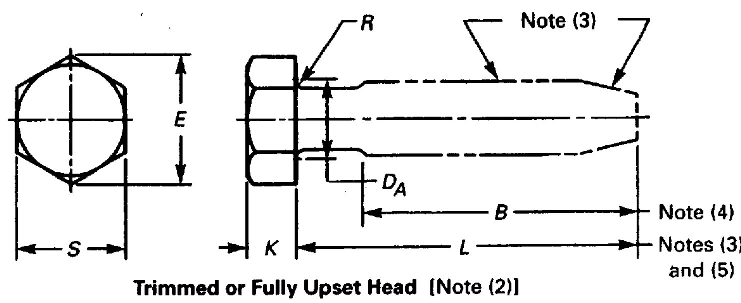
Nominal Screw Size and Thread Pitch	Head Diameter, D_K Max.	Head Diameter, D_K Min.	Head Height, K Max.	Head Height, K Min.	Head Radius, R_1, Reference	Underhead Fillet: Max. Transition Diameter, D_A	Underhead Fillet: Min. Radius, R	Recess Across Flats, M	Recess Depth, T, Reference	Driver Size [Note (5)]	Recess Penetration Gaging Depth, P Max.	Recess Penetration Gaging Depth, P Min.
Types AB, B, BF, and BT [Note (2)]												
2.9 × 1	5.6	5.3	2.4	2.2	5.0	3.5	0.1	1.78	1.68	0	0.97	0.71
3.5 × 1.3	7.0	6.6	2.6	2.3	6.0	4.1	0.1	2.31	2.69	1R	1.66	1.27
4.2 × 1.4	8.0	7.6	3.1	2.8	6.5	4.9	0.2	2.84	3.23	2R	1.91	1.52
4.8 × 1.6	9.5	9.1	3.7	3.4	8.0	5.5	0.2	2.84	3.23	2R	1.91	1.52
5.5 × 1.8	11.0	10.5	4.0	3.7	9.0	6.3	0.2	3.38	4.01	3R	2.42	2.03
6.3 × 1.8	12.0	11.5	4.6	4.3	10.0	7.1	0.3	3.38	4.01	3R	2.42	2.03
8 × 2.1	16.0	15.5	6.0	5.6	13.0	9.2	0.4	4.85	4.93	4R	2.54	2.15
9.5 × 2.1	20.0	19.4	7.5	7.1	16.0	10.7	0.4	4.85	4.93	4R	2.54	2.15
Types D, F, and T [Note (2)]												
2.5 × 0.45	5.0	4.7	2.1	1.9	4.0	3.1	0.1	1.78	1.68	0	0.97	0.71
3 × 0.5	5.6	5.3	2.4	2.2	5.0	3.6	0.1	1.78	1.68	0	0.97	0.71
3.5 × 0.6	7.0	6.6	2.6	2.3	6.0	4.1	0.1	2.31	2.69	1R	1.66	1.27
4 × 0.7	8.0	7.6	3.1	2.8	6.5	4.7	0.2	2.84	3.23	2R	1.91	1.52
5 × 0.8	9.5	9.1	3.7	3.4	8.0	5.7	0.2	2.84	3.23	2R	1.91	1.52
6 × 1	12.0	11.5	4.6	4.3	10.0	6.8	0.3	3.38	4.01	3R	2.42	2.03
8 × 1.25	16.0	15.5	6.0	5.6	13.0	9.2	0.4	4.85	4.93	4R	2.54	2.15
10 × 1.5	20.0	19.4	7.5	7.1	16.0	11.2	0.4	4.85	4.93	4R	2.54	2.15

GENERAL NOTES:
(a) For additional requirements refer to section 2, titled General Data.
(b) Dimensions are in millimeters.

NOTES:
(1) This type of recess has a square center opening, slightly tapered side walls, and a conical bottom, with top edges relieved or rounded.
(2) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(3) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(4) See Table 22 for recommended tapping screw nominal lengths.
(5) R = Regular



Indented Head [Note (2)]



Trimmed or Fully Upset Head [Note (2)]

TABLE 20 DIMENSIONS OF HEX HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Hex Width Across Flats, S [Notes (6), (7)] Max.	Hex Width Across Flats, S [Notes (6), (7)] Min.	Min. Hex Width Across Corners, E [Notes (6), (7)]	Head Height, K Max.	Head Height, K Min.	Underhead Fillet: Max. Transition Diameter, D_K	Underhead Fillet: Min. Radius, R	Min. Head Protrusion Beyond Gaging Ring, F [Note (7)]
Types AB, B, BF, and BT [Note (3)]								
2.2 × 0.8	3.20	3.02	3.38	1.6	1.3	2.8	0.1	0.78
2.9 × 1	5.00	4.82	5.40	2.3	2.0	3.5	0.1	1.20
3.5 × 1.3	5.50	5.32	5.96	2.6	2.3	4.1	0.1	1.38
4.2 × 1.4	7.00	6.78	7.59	3.0	2.6	4.9	0.2	1.56
4.8 × 1.6	8.00	7.78	8.71	3.8	3.3	5.5	0.2	1.98
5.5 × 1.8	8.00	7.78	8.71	4.1	3.6	6.3	0.2	2.16
6.3 × 1.8	10.00	9.78	10.95	4.7	4.1	7.1	0.3	2.46
8 × 2.1	13.00	12.73	14.26	6.0	5.2	9.2	0.4	3.12
9.5 × 2.1	16.00	15.73	17.62	7.5	6.5	10.7	0.4	3.90
9.5 × 2.1 [Note (8)]	15.00	14.73	16.50	7.5	6.5	10.7	0.4	3.90
Types D, F, and T [Note (3)]								
2 × 0.4	3.20	3.02	3.38	1.6	1.3	2.6	0.1	0.78
2.5 × 0.45	4.00	3.82	4.28	2.1	1.8	3.1	0.1	1.08
3 × 0.5	5.00	4.82	5.40	2.3	2.0	3.6	0.1	1.20
3.5 × 0.6	5.50	5.32	5.96	2.6	2.3	4.1	0.1	1.38
4 × 0.7	7.00	6.78	7.59	3.0	2.6	4.7	0.2	1.56
5 × 0.8	8.00	7.78	8.71	3.8	3.3	5.7	0.2	1.98
6 × 1	10.00	9.78	10.95	4.7	4.1	6.8	0.3	2.46
8 × 1.25	13.00	12.73	14.26	6.0	5.2	9.2	0.4	3.12
10 × 1.5	16.00	15.73	17.62	7.5	6.5	11.2	0.4	3.90
10 × 1.5 [Note (8)]	15.00	14.73	16.50	7.5	6.5	11.2	0.4	3.90

GENERAL NOTES:
(a) The comparable ISO standard is ISO 1479.
(b) For additional requirements refer to section 2, titled General Data.
(c) Dimensions are in millimeters.

NOTES:
(1) A slight rounding of all edges of the hexagon surfaces of indented hex heads shall be permissible provided the diameter of the bearing circle is not less than the equivalent of 90% of the specified minimum width across flats dimension.
(2) Heads may be indented, trimmed, or fully upset at the option of the manufacturer.
(3) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(4) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(5) See Table 22 for recommended tapping screw nominal lengths.
(6) Dimensions across flats and across corners of the head shall be measured at the point of maximum metal. Taper of sides of head (angle between one side and the axis) shall not exceed 2 deg or 0.10 mm, whichever is greater, of the specified width across flats being the large dimension.
(7) The rounding due to lack of fill at all six corners of the head shall be reasonably uniform, and the width across corners of the head shall be such that when a sharp ring having an inside diameter equal to the specified minimum width across corners, within a tolerance of +0.00, −0.01 mm, is placed on the top and bottom of the head, the head shall protrude a distance equal to or greater than the F value tabulated. See Appendix II for across-corners gaging of hex heads.
(8) The 9.5 and 10 mm size screws having heads with 15-mm width across flats are not ISO standard. Unless 9.5-mm and 10-mm size screws with 15-mm width across flats are specifically ordered, 9.5-mm and 10-mm size screws with 16-mm width across flats shall be furnished.

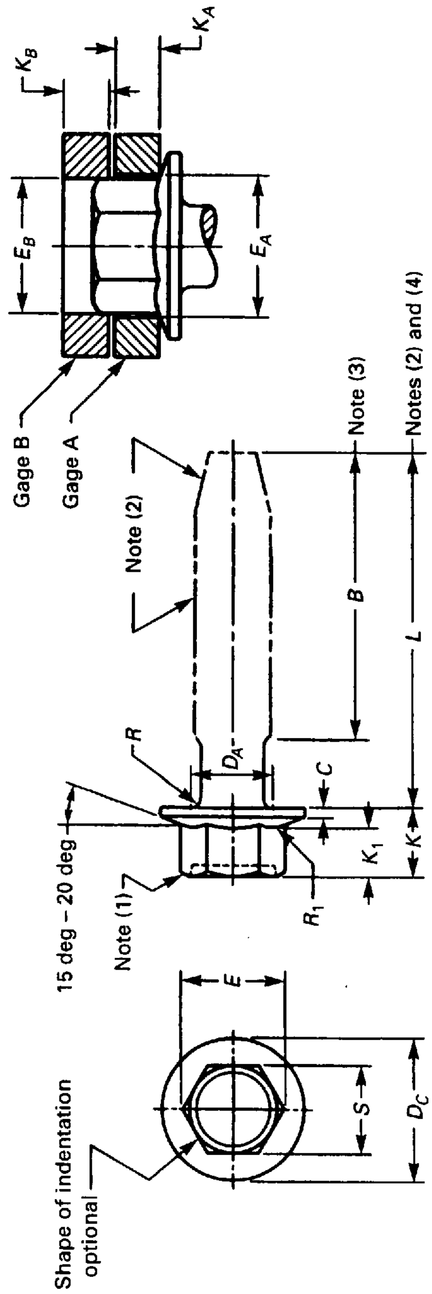


TABLE 21 ILLUSTRATION

TABLE 21 DIMENSIONS OF HEX FLANGE HEAD TAPPING SCREWS

Nominal Screw Size and Thread Pitch	Hex Width Across Flats, S [Note (5)]		Min. Hex Width Across Corners, E [Notes (5), (6)]	Flange Diameter, D_C		Max. Overall Head Height, K	Min. Hex Height, K_1 [Note (6)]	Min. Flange Edge Thickness, C [Note (7)]	Max. Flange Top Fillet Radius, R_1	Underhead Fillet		Gage A		Gage B	
	Max.	Min.		Max.	Min.					Max. Transition, D_A	Min. Radius, R	Gage Inside Diameter, E_A +0.01 −0.00	Gage Thickness, K_A +0.00 −0.01	Gage Inside Diameter, E_B +0.00 −0.01	Min. Gage Thickness, K_B
Types AB, B, BF, and BT [Note (2)]															
2.2 × 0.8	3.00	2.84	3.16	4.5	4.1	2.2	1.3	0.3	0.1	2.8	0.1	3.47	0.85	3.15	2.0
2.9 × 1	4.00	3.84	4.27	6.4	5.9	3.2	1.9	0.4	0.2	3.5	0.1	4.62	1.25	4.26	2.0
3.5 × 1.3	5.00	4.82	5.36	7.5	6.9	3.8	2.4	0.5	0.2	4.1	0.1	5.77	1.60	5.35	2.0
4.2 × 1.4	5.50	5.32	5.92	8.5	7.8	4.3	2.8	0.6	0.2	4.9	0.2	6.35	1.80	5.91	3.0
4.8 × 1.6	7.00	6.78	7.55	10.0	9.3	5.2	3.3	0.6	0.3	5.5	0.2	8.08	2.20	7.54	3.0
5.5 × 1.8	7.00	6.78	7.55	11.2	10.3	6.0	3.8	0.8	0.3	6.3	0.2	8.08	2.50	7.54	3.0
6.3 × 1.8	8.00	7.78	8.66	12.8	11.8	6.7	4.2	1.0	0.4	7.1	0.3	9.24	2.80	8.65	3.0
8 × 2.1	10.00	9.78	10.89	16.8	15.5	8.6	5.6	1.2	0.5	9.2	0.4	11.55	3.70	10.88	4.0
9.5 × 2.1	13.00	12.72	14.16	21.0	19.3	10.7	7.0	1.4	0.6	10.7	0.4	15.01	4.60	14.15	4.0
Types D, F, and T [Note (2)]															
2 × 0.4	3.00	2.84	3.16	4.5	4.1	2.2	1.3	0.3	0.1	2.6	0.1	3.47	0.85	3.15	2.0
2.5 × 0.45	3.20	3.04	3.39	5.4	5.0	2.7	1.6	0.3	0.2	3.1	0.1	3.70	1.05	3.38	2.0
3 × 0.5	4.00	3.84	4.27	6.4	5.9	3.2	1.9	0.4	0.2	3.6	0.1	4.62	1.25	4.26	2.0
3.5 × 0.6	5.00	4.82	5.36	7.5	6.9	3.8	2.4	0.5	0.2	4.1	0.1	5.77	1.60	5.35	2.0
4 × 0.7	5.50	5.32	5.92	8.5	7.8	4.3	2.8	0.6	0.2	4.7	0.2	6.35	1.80	5.91	3.0
5 × 0.8	7.00	6.78	7.55	10.6	9.8	5.4	3.5	0.7	0.3	5.7	0.2	8.08	2.30	7.54	3.0
6 × 1	8.00	7.78	8.66	12.8	11.8	6.7	4.2	1.0	0.4	6.8	0.3	9.24	2.80	8.65	3.0
8 × 1.25	10.00	9.78	10.89	16.8	15.5	8.6	5.6	1.2	0.5	9.2	0.4	11.55	3.70	10.88	4.0
10 × 1.5	13.00	12.72	14.16	21.0	19.3	10.7	7.0	1.4	0.6	11.2	0.4	15.01	4.60	14.15	4.0

GENERAL NOTES:
(a) For reference, see Table 21 illustration beginning on page 33.
(b) The comparable ISO standard is ISO 10509.
(c) For additional requirements refer to section 2, titled General Data.
(d) Dimensions are in millimeters.

NOTES:
(1) A slight rounding of all edges and corners of the hexagon surfaces of heads shall be permissible, and the rounding due to the lack of fill at all six corners of the head shall be reasonably uniform.
(2) See Tables 5, 6, and 7 for thread and point dimensions and minimum screw lengths applicable to the respective screw types.
(3) See Tables 1 and 2 for thread length requirements applicable to the respective screw types.
(4) See Table 22 for recommended tapping screw nominal lengths.
(5) Dimensions across flats and across corners of the head shall be measured at the point of maximum metal. Taper of sides of head (angle between one side and the axis) shall not exceed 2 deg or 0.10 mm, whichever is greater, with the specified width across flats being the large dimension.
(6) The acceptability of hex height, wrenching height, corner fill, and width across corners shall be determined using two ring gages, A and B. Gage A shall be placed over the hex and shall seat on the flange. Gage B shall be placed on the top of the head with the faces perpendicular to the screw axis. The two gages shall not be in contact.
(7) The contour of the edge at the periphery of flange shall be optional provided the minimum flange thickness is maintained at the minimum flange diameter. The top surface of the flange may be straight or slightly rounded (convex) upward.

TABLE 22 RECOMMENDED NOMINAL SCREW LENGTHS FOR TAPPING SCREWS

Nominal Screw Length	Nominal Screw Size for Types AB, B, BF, and BT									
	2.2	...	2.9	3.5	4.2	4.8	5.5	6.3	8	9.5
	Nominal Screw Size for Types D, F, and T									
	2	2.5	3	3.5	4	5	...	6	8	10
4	P, H	P, H	...	...	...	...	...	...	...	...
5	P, H	P, H	...	...	...	...	...	...	...	...
6	A	A	P, H	...	...	...	...	...	...	...
8	A	A	A	P, H	P, H	...	...	...	...	...
10	A	A	A	A	A	P, H	...	...	...	...
13	A	A	A	A	A	A	P, H	P, H	...	...
16	...	A	A	A	A	A	A	A	P, H	...
20	...	...	...	A	A	A	A	A	A	P, H
25	...	...	...	A	A	A	A	A	A	A
30	...	...	...	...	...	A	A	A	A	A
35	...	...	...	...	...	A	A	A	A	A
40	...	...	...	...	...	...	A	A	A	A
45	...	...	...	...	...	...	...	...	A	A
50	...	...	...	...	...	...	...	...	A	A
55	...	...	...	...	...	...	...	...	...	A
60	...	...	...	...	...	...	...	...	...	A

GENERAL NOTE: The nominal screw lengths included between the heavy lines are recommended for the respective screw sizes and screw head styles as designated by the following symbols:
A = screws of all head styles covered in this Standard
H = hex and hex flange head screws
P = pan head screws

TABLE 23 CHEMICAL COMPOSITION LIMITS

Nominal Screw Size	Analysis [Note (1)]	Chemical Composition Percent by Weight [Note (2)]	
		Carbon	Manganese
2 through 3	Ladle	0.13–0.25	0.60–1.65
	Check	0.11–0.27	0.57–1.71
3.5 through 10	Ladle	0.15–0.25	0.70–1.65
	Check	0.13–0.27	0.64–1.71

NOTES:
(1) Ladle analyses may be used for routine reporting. Check analyses refer to individual determinations on carburized or core portion of screws and shall be used for reference or as required by the purchaser.
(2) Boron shall be permitted from 0.0005% to 0.003%.

TABLE 24 TOTAL CASE DEPTH

Nominal Screw Size	Total Case Depth	
	Max.	Min.
2 through 3.5	0.18	0.05
4 through 5.5	0.23	0.10
6 through 10	0.28	0.13

GENERAL NOTE: Dimensions are in millimeters.

MANDATORY APPENDIX I
PROTRUSION GAGING OF FLAT AND OVAL COUNTERSUNK HEADS

I1 FLAT COUNTERSUNK HEADS

Suitability of flat countersunk head screws for application in countersinks designed to the principal dimensions of the screws may be determined by use of a protrusion gage as illustrated in Fig. I1.

The gaging dimensions and the gage diameters are specified in the dimensional tables for flat countersunk head screws. The protrusion limits shown in the tables shall apply only when the gaging diameter is exactly as indicated with the gaging edge of a sharpness obtained by lapping the hole and the top surface of the gage. Any variation in the gaging diameter will require recalculation of protrusion values by the original formulas given below:

Maximum protrusion[1]:

$$\text{Max. } F = \frac{\text{Max. Sharp Head Diameter} - \text{Gage Hole Diameter}}{2} \times \tan\left(90\text{ deg} - \frac{\text{Min. Head Angle}}{2}\right)$$

Minimum protrusion[1]:

$$\text{Min. } F = \frac{\text{Min. Sharp Head Diameter} - \text{Gage Hole Diameter}}{2} \times \tan\left(90\text{ deg} - \frac{\text{Max. Head Angle}}{2}\right)$$

or correction of protrusion in accordance with the following formula:

$$F' = F\frac{D_K - G'}{D_K - G}$$

where

D_K = head diameter (maximum or minimum for maximum or minimum protrusion, respectively)

F = tabulated protrusion value

F' = corrected protrusion value

G = tabulated gage diameter

G' = measured gage diameter

Tabulated gage diameters are determined from the following formula:

D = basic screw diameter of Types D, F, and T tapping screws and 5.50 mm on the 5.5-mm size of Types AB, B, BF, and BT tapping screws

G = $1.83D - 0.838$ mm for screw sizes 8 mm and smaller

= $1.79D - 2.360$ mm for screw sizes 9.5 and 10 mm

To ensure adequate service life, the protrusion gage should be made of tool steel having a hardness of not less than 60 HRC.

I2 OVAL COUNTERSUNK HEADS

Suitability of oval countersunk head screws for application in countersinks designed to the principal dimensions of the screws may be determined by use of a protrusion gage as illustrated in Fig. I2.

The gaging dimensions and the gage diameters are specified in the dimensional tables for oval countersunk head screws. The protrusion limits shown in the tables shall apply only when the gaging diameter is exactly as indicated with the gaging edge of a sharpness obtained by lapping the hole and the top surface of the gage. Any variation in the gaging diameter will require recalculation of protrusion values by the original formulas given below:

Maximum protrusion[2]:

[1] Protrusion values shown in Tables 8 through 11 are determined from these formulas and are rounded upward to the nearest millimeter for the maximum and downward to the nearest millimeter for the minimum.

[2] Protrusion values shown in Tables 12 through 15 are determined from these formulas and are rounded upward to the nearest millimeter for the maximum and downward to the nearest millimeter for the minimum.

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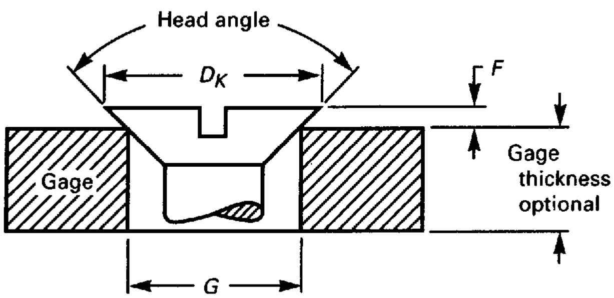

FIG. I1 PROTRUSION GAGE FOR FLAT COUNTERSUNK HEADS

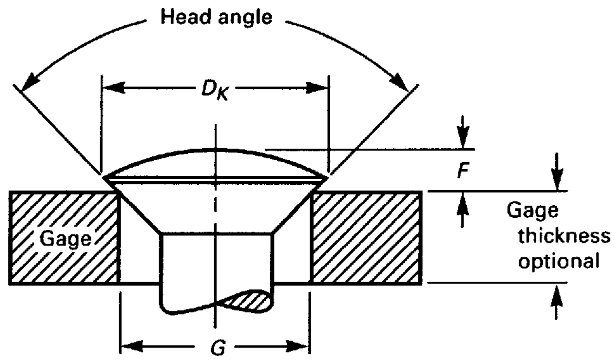

FIG. I2 PROTRUSION GAGE FOR OVAL COUNTERSUNK HEADS

Max. F =

$$O \text{ Max.} + \frac{\text{Max. Sharp Head Diameter} - \text{Gage Hole Diameter}}{2} \times \tan\left(90 \text{ deg} - \frac{\text{Min. Head Angle}}{2}\right)$$

Minimum protrusion[2]:

Min. F =

$$O \text{ Max.} + \frac{\text{Min. Sharp Head Diameter} - \text{Gage Hole Diameter}}{2} \times \tan\left(90 \text{ deg} - \frac{\text{Max. Head Angle}}{2}\right)$$

or correction of protrusion in accordance with the following formula:

$$F' = O \text{ Max.} + (F - O \text{ Max.}) \times \frac{D_K - G'}{D_K - G}$$

where

D_K = head diameter (maximum or minimum for maximum or minimum protrusion, respectively)

F = tabulated protrusion value

F' = corrected protrusion value

G = tabulated gage diameter

G' = measured gage diameter

Tabulated gage diameters are determined from the following formula:

D = basic screw diameter of Types D, F, and T tapping screws and 5.50 mm on the 5.5-mm size of Types AB, B, BF, and BT tapping screws

G = $1.83D - 0.838$ mm for screw sizes 8 mm and smaller

= $1.79D - 2.360$ mm for screw sizes 9.5 and 10 mm

To ensure adequate service life, the protrusion gage should be made of tool steel having a hardness of not less than 60 HRC.

MANDATORY APPENDIX II
ACROSS-CORNERS GAGING OF HEX HEADS

Suitability of across-corners dimensions of hex head screws may be determined using gaging rings as described below.

When the gaging ring (Fig. II1) is placed on the top and bottom of a hex head screw at right angles to the axis of the screw, the head must protrude beyond the ring by an amount equal to 60% of the specified minimum head height, *K*. For convenience, the applicable minimum protrusion values are given in the dimensional table for hex head screws.

The gaging ring shall have an inside diameter equal to the tabulated minimum width across corners, *E*, within a tolerance of +0.00, −0.01 mm. The gaging edges of the ring shall be sharp, and opposite faces shall be parallel. To ensure adequate service life, the ring should be made of tool steel and have a hardness of not less than 60 HRC.

A typical gaging fixture is shown in Fig. II2 with an explanation of its application; however, any equivalent means may be used.

To check hex head screws from the top, an initial reading shall be taken with the gaging ring placed on the indexing plate. Then, with the screw placed in the fixture, the gaging ring shall be placed on top of the screw head, and a second reading shall be taken. The difference between the two readings is equal to the protrusion, *F*, of the head beyond the gaging ring.

Gaging the bottom of the head on hex head screws may be accomplished in the same manner as gaging the top, except the ring is placed below the head. The same protrusion values shall apply.

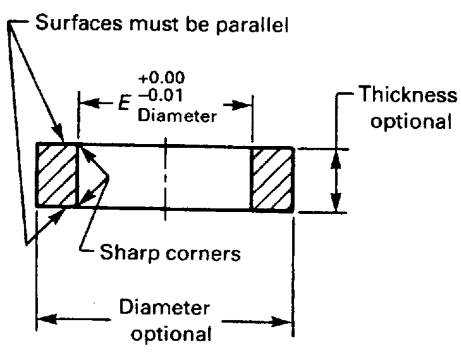

FIG. II1 GAGING RING

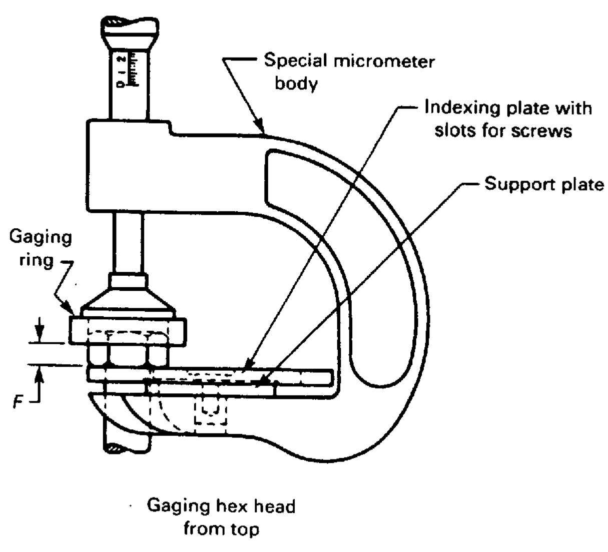

FIG. II2 TYPICAL GAGING FIXTURE

MANDATORY APPENDIX III
PENETRATION GAGING OF RECESSED HEADS

Penetration gaging is a test to determine the suitability of recesses in the heads of screws and may be used to indicate deficiencies in the dimensions of the recesses specified in the dimensional tables. (Refer to Figs. III1, III2, and III3 for illustrations of penetration gages for Type I, IA, and III recesses, respectively.) Penetrations that are too deep indicate the possible presence of a thin section between the head and shank of the screw, a weakness that might result in the twisting off of screw heads during tightening of the screws. Use of screws having shallow penetrations might result in such production problems as reaming of recesses, excessive wear, or driver bits.

Penetration gaging depth values for the various styles of recessed heads are included in Tables III1 through III5. These values were predicated originally on the gaging of plain finish (unplated or uncoated) screws. Subsequent experience, however, has shown the Type I recess penetration limits, as tabulated, and Types IA and III recess penetration depths with tabulated minimum limit reduced by up to 0.12 mm to be suitable for the gaging of screws having coating thickness of up to and including 0.008 mm (8 μm) on significant surfaces.

For screws having heavier coatings it is not practical to use penetration gaging for acceptance of the finished product. Where it is considered desirable, however, to verify the suitability of the recess in such screws before plating or coating, the screws shall be stripped of finish and gaged in the plain condition.

Dimensions of gage points to be used for penetration gaging of Types I, IA, and III recesses are presented in Tables III2, III3, and III5, respectively. Also specified in Tables III1 and III4 are gage heads that adapt the gage points for all of the recess types to standard dial gage shafts. The threaded hole specified for the set screw in existing gage heads is $\frac{1}{4}$-20 UNC-2B per ASME B1.1.

A threaded hole of M6 × 1 size conforming to ASME B1.13M for use with a mating metric set screw would be considered comparable where desired for application in new gage heads.

Penetration is gaged relative to a reference plane defined by the intersection of the edge of the recess wings on Types I and IA recesses and the sides of the square on Type III recess with the top surface of the screw head. This plane is the same as the top surface of a flat head screw, but for Types I and IA recesses it is somewhat below the topmost portion of heads that have rounded top surfaces. Knife edges or tapered ridges on the gage heads for Types I and IA are used to establish the reference plate. A reverse reading dial gage is used to indicate the penetration of the gage point into the recess. The gage may be zeroed on any flat surface.

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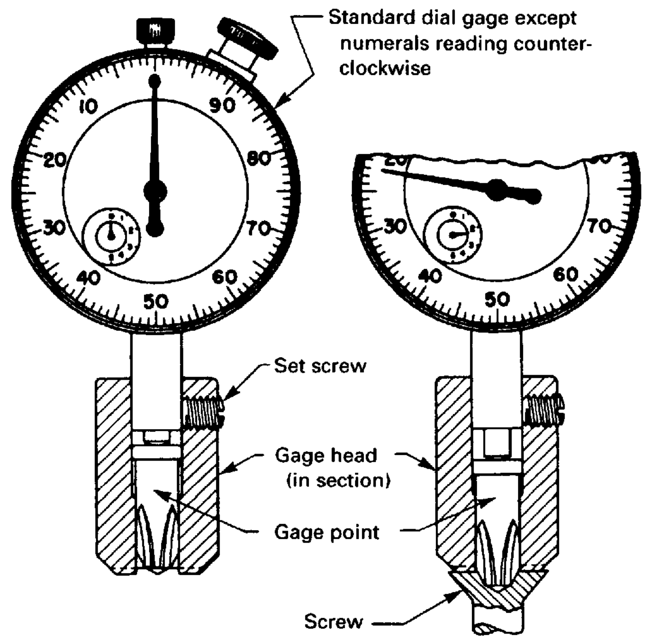
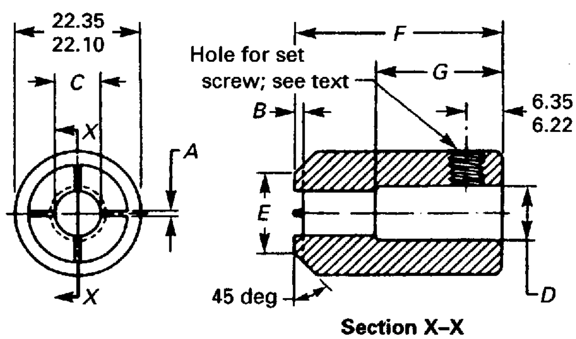


FIG. III1 PENETRATION GAGE FOR TYPE I RECESS



Gage Head

TABLE III1 DIMENSIONS OF GAGE HEADS FOR TYPES I AND IA RECESSES

Size of Recess Gage	Edge Width, *A*, ±0.05	Edge Height, *B*, ±0.08	Hole Diameter, *C*, ±0.005	Counterbore Diameter, *D*, ±0.03	Nose Diameter, *E*, ±0.13	Overall Length, *F*, ±0.13	Counterbore Depth, *G*, ±0.13
No. 0	0.20	0.38	1.168	9.58	14.27	42.88	28.60
No. 1	0.30	0.51	2.235	9.58	14.27	42.88	28.60
No. 2	0.46	0.79	3.607	9.58	14.27	42.88	28.60
No. 3	0.56	0.94	5.334	9.58	14.27	42.88	28.60
No. 4	0.79	1.57	7.950	9.58	14.27	42.88	28.60

GENERAL NOTE: Dimensions are in millimeters.

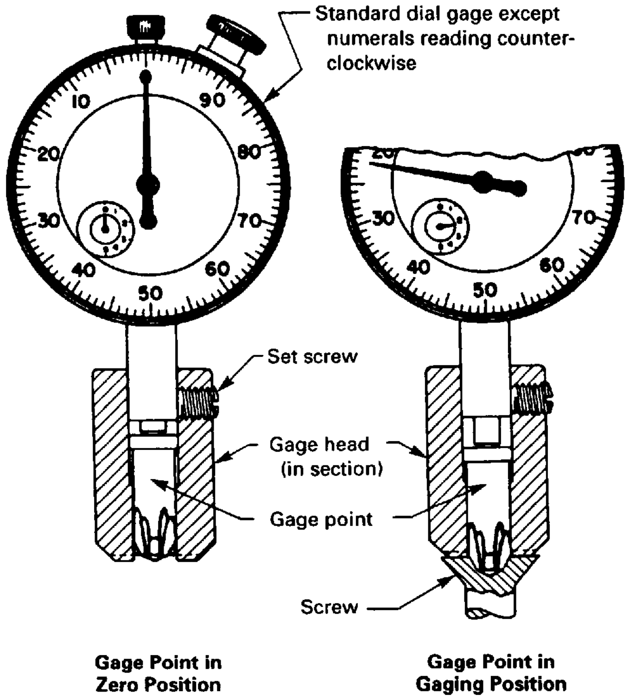


FIG. III2 PENETRATION GAGE FOR TYPE IA RECESS

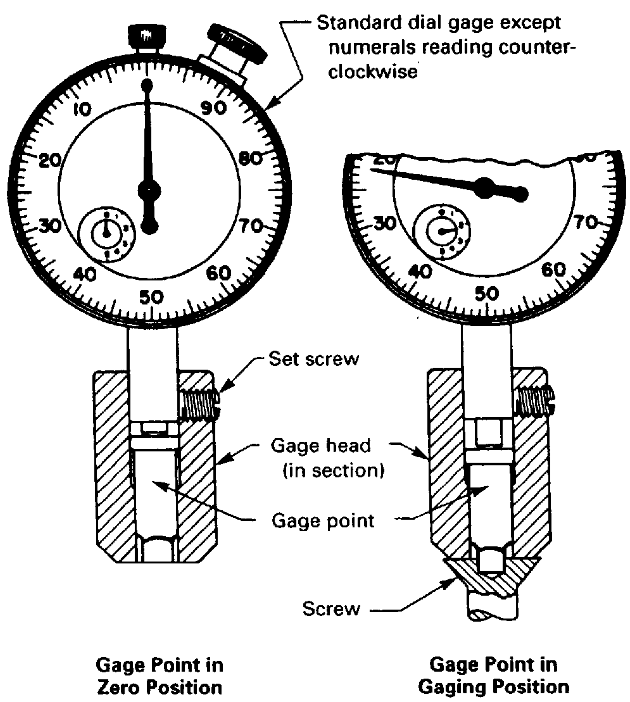
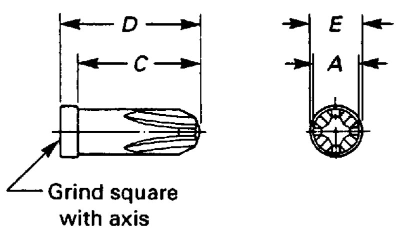
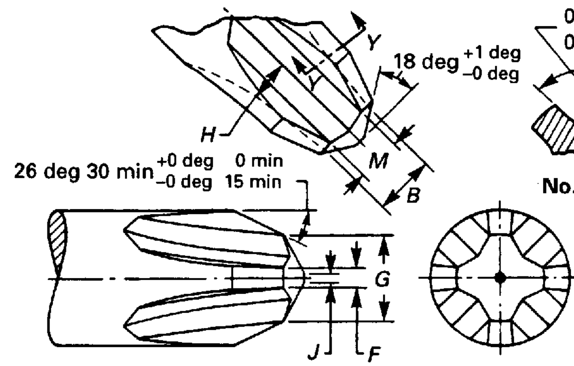


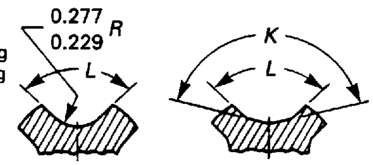
FIG. III3 PENETRATION GAGE FOR TYPE III RECESS



Gage Point



Enlarged Point Detail



No. 0 size

All other sizes

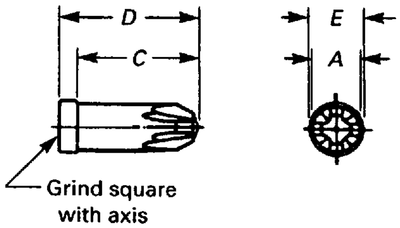
Half Section Y-Y

TABLE III2 DIMENSIONS OF GAGE POINTS FOR TYPE I RECESS

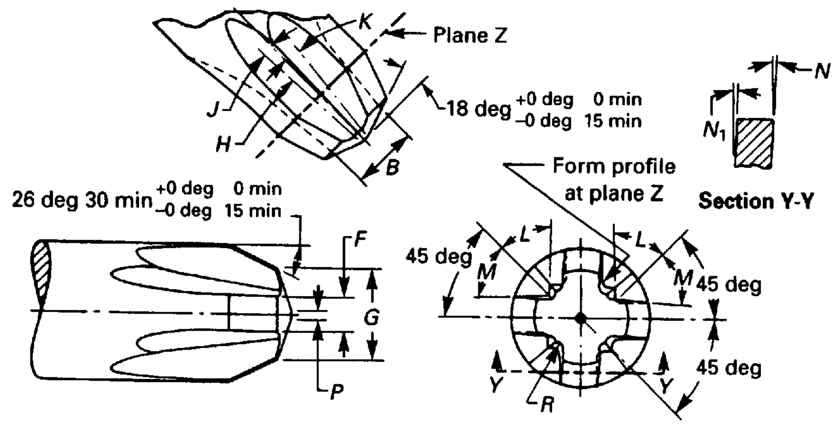
Size of Recess Gage	Point Diameter, *A*, ±0.005	Point Width, *B*, +0.000 −0.025	Length, *C*, ±0.13	Overall Length, *D*, ±0.13	Diameter, *E*, ±0.13	Wing Thickness, *F* Max.	Wing Thickness, *F* Min.	Point Width, *G*, +0.025 −0.000	Milling Angle, *H*, +0 deg 0 min −0 deg 15 min	Flat on End, *J* Max.	Flat on End, *J* Min.	Base Flute Angle, *K*, +0 deg 15 min −0 deg 0 min	Side Flute Angle, *L*, +0 deg 15 min −0 deg 0 min	Flute Width at Bottom, *M*, +0.000 −0.025
No. 0	1.143	0.610	16.66	19.84	2.39	0.30	0.25	0.813	7 deg 0 min	0.38	0.25	[Note (1)]	92 deg 0 min	0.384 [Note (2)]
No. 1	2.210	1.001	17.48	20.62	3.96	0.51	0.46	1.270	7 deg 0 min	0.51	0.38	138 deg 0 min	92 deg 0 min	0.513
No. 2	3.581	1.539	19.05	22.22	5.56	0.64	0.58	2.286	5 deg 45 min	0.51	0.38	140 deg 0 min	92 deg 0 min	1.102
No. 3	5.309	2.497	19.84	23.01	6.35	0.79	0.74	3.810	5 deg 45 min	0.51	0.38	146 deg 0 min	92 deg 0 min	2.098
No. 4	7.925	3.574	21.44	24.61	9.12	1.12	1.07	5.080	7 deg 0 min	0.51	0.38	153 deg 0 min	92 deg 0 min	2.738

GENERAL NOTE: Dimensions are in millimeters.

NOTES:
(1) Base of the flute on recess size No. 0 is a 0.229-mm to 0.277-mm radius.
(2) Tolerance on recess size No. 0 is +0.000, −0.066 mm.



Gage Point



Enlarged Point Detail

TABLE III3 DIMENSIONS OF GAGE POINTS FOR TYPE IA RECESS

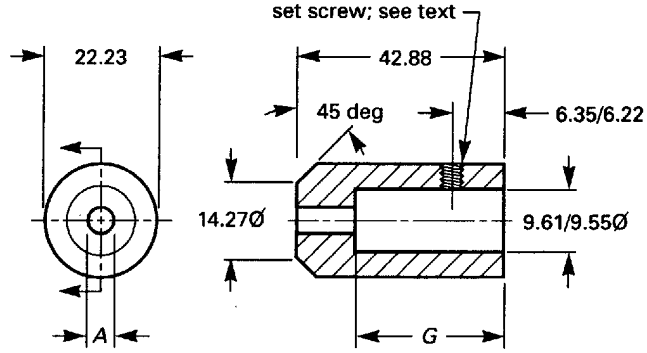
Size of Recess Gage	Point Diameter, A, ±0.005	Point Width (at Base of R Radius), B Max.	Point Width (at Base of R Radius), B Min.	Length, C, ±0.13	Overall Length, D, ±0.13	Diameter, E, ±0.13	Wing Thickness, F, +0.025 −0.000	Point Width, G, +0.025 −0.000	Milling Angle, H, +0 deg, 0 min −0 deg, 6 min	Milling Offset Angle, J, +0 deg, 6 min −0 deg, 0 min
No. 0	1.143	0.711	0.673	16.66	19.84	2.39	0.420	0.889	7 deg, 0 min	4 deg, 23 min
No. 1	2.210	1.112	1.074	17.48	20.62	3.96	0.673	1.372	7 deg, 0 min	4 deg, 23 min
No. 2	3.581	1.702	1.664	19.05	22.22	5.56	0.965	2.413	5 deg, 45 min	3 deg, 0 min
No. 3	5.309	2.591	2.553	19.84	23.01	6.35	1.346	3.937	5 deg, 45 min	3 deg, 0 min
No. 4	7.925	3.861	3.823	21.44	24.61	9.12	2.057	5.156	7 deg, 0 min	4 deg, 23 min

Size of Recess Gage	Milling Offset Angle, K, +0 deg, 6 min −0 deg, 0 min	Rib Form Angle, L, +0 deg, 7 min −0 deg, 0 min [Note (1)]	Wing Form Angle, M, +0 deg, 7 min −0 deg, 0 min [Note (1)]	Wing Offset Angle, N	Wing Offset Angle, N_1	Flat on End, P, +0.13 −0.00	Radius, R Max.	Radius, R Min.
No. 0	7 deg, 45 min	46 deg, 0 min	46 deg, 0 min	0 deg, 22 min	2 deg, 0 min	0.25	0.101	0.076
No. 1	7 deg, 45 min	46 deg, 0 min	46 deg, 0 min	0 deg, 22 min	2 deg, 0 min	0.38	0.127	0.102
No. 2	6 deg, 20 min	46 deg, 0 min	46 deg, 0 min	0 deg, 17 min	2 deg, 4 min	0.38	0.203	0.152
No. 3	6 deg, 20 min	56 deg, 15 min	46 deg, 0 min	0 deg, 17 min	2 deg, 4 min	0.38	0.305	0.203
No. 4	7 deg, 45 min	56 deg, 15 min	46 deg, 0 min	0 deg, 22 min	2 deg, 0 min	0.38	0.508	0.356

GENERAL NOTE: Dimensions are in millimeters.

NOTE:

(1) Angles L and M shall be measured perpendicular to the milling cut.



Gage Head

TABLE III4 DIMENSIONS FOR PENETRATION GAGE HEADS FOR TYPE III RECESS

Size of Recess Gage		00	0	1	2	3	4
A	±0.005	2.578	2.578	3.607	4.102	5.334	6.896
G	±0.13	28.60	28.60	28.60	28.60	28.60	28.60

GENERAL NOTE: Dimensions are in millimeters.

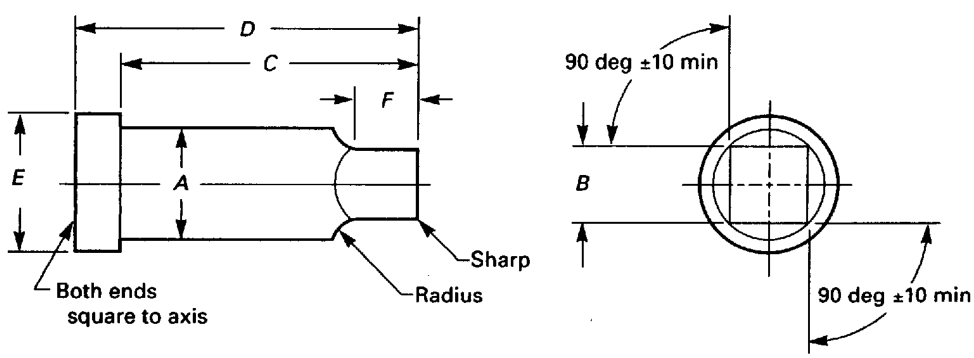


TABLE III5 DIMENSIONS OF PENETRATION GAGE POINTS FOR TYPE III RECESS

Recess Gage Size	Gage Point Diameter, *A*, +0.013 −0.000	Width Across Flats, *B*, +0.0127 −0.0000	Length, *C*, ±0.13	Overall Length, *D*, ±0.13	Diameter, *E*, +0.00 −0.38	Point Length, *F*, +0.76 −0.00
00	2.553	1.245	19.94	22.23	4.75	1.91
0	2.553	1.753	19.94	22.23	4.75	3.18
1	3.569	2.286	19.94	22.23	4.75	4.75
2	4.077	2.820	19.94	22.23	6.35	4.75
3	5.296	3.340	19.94	22.23	6.35	4.75
4	6.871	4.814	19.94	22.23	7.93	5.38

GENERAL NOTE: Dimensions are in millimeters.

TABLE B1 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE AB THREAD-FORMING TAPPING SCREWS IN SHEET METALS

Nominal Screw Size and Thread Pitch	Metal Thickness	Steel, Stainless Steel, Monel, Brass			Aluminum Alloy		
		Pierced or Extruded Hole, Hole Diameter	Drilled or Clean-Punched Hole		Pierced or Extruded Hole, Hole Diameter	Drilled or Clean-Punched Hole	
			Hole Diameter	Drill Size No. [Note (1)]		Hole Diameter	Drill Size No. [Note (1)]
2.2 × 0.8	0.38	...	1.63	52	...	...	...
	0.46	...	1.63	52	...	...	...
	0.61	...	1.70	51	...	1.63	52
	0.76	...	1.78	50	...	1.63	52
	0.91	...	1.85	49	...	1.63	52
	1.22	...	1.85	49	...	1.70	51
	1.52	...	1.93	48	...	1.78	50
2.9 × 1	0.38	2.18	2.18	44	...	...	...
	0.46	2.18	2.18	44	...	...	...
	0.61	2.49	2.26	43	2.18	...	...
	0.76	2.49	2.39	42	2.18	2.18	44
	0.91	2.49	2.39	42	2.18	2.19	44
	1.22	...	2.44	41	2.18	2.18	44
	1.52	...	2.54	39	...	2.26	43
	1.90	...	2.59	38	...	2.26	43
3.5 × 1.3	0.38	2.82	2.64	37	...	...	...
	0.46	2.82	2.64	37	...	...	...
	0.61	2.82	2.69	36	2.82	...	...
	0.76	2.82	2.69	36	2.82	2.64	37
	0.91	2.82	2.79	35	2.82	2.64	37
	1.22	...	2.82	34	2.82	2.64	37
	1.52	...	2.95	32	...	2.69	36
	1.90	...	3.05	31	...	2.79	35
4.2 × 1.4	0.46	3.45	...	...	...	...	...
	0.61	3.45	3.18	...	3.45	...	...
	0.76	3.45	3.18	...	3.45	2.95	32
	0.91	3.45	3.18	...	3.45	3.05	31
	1.22	3.45	3.25	30	3.45	3.25	30
	1.52	...	3.45	29	...	3.45	29
	1.90	...	3.56	28	...	3.56	28
4.8 × 1.6	0.46	3.99	3.66	27	...	...	...
	0.61	3.99	3.66	27	3.99	...	...
	0.76	3.99	3.66	27	3.99	...	...
	0.91	3.99	3.73	26	3.99	3.66	27
	1.22	3.99	3.78	25	3.99	3.66	27
	1.52	...	3.91	23	...	3.66	27
	1.90	...	3.99	22	...	3.73	26

(continued)

TABLE B1 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE AB THREAD-FORMING TAPPING SCREWS IN SHEET METALS (CONT'D)

Nominal Screw Size and Thread Pitch	Metal Thickness	Steel, Stainless Steel, Monel, Brass: Pierced or Extruded Hole, Hole Diameter	Steel, Stainless Steel, Monel, Brass: Drilled or Clean-Punched Hole, Hole Diameter	Steel, Stainless Steel, Monel, Brass: Drilled or Clean-Punched Hole, Drill Size No. [Note (1)]	Aluminum Alloy: Pierced or Extruded Hole, Hole Diameter	Aluminum Alloy: Drilled or Clean-Punched Hole, Hole Diameter	Aluminum Alloy: Drilled or Clean-Punched Hole, Drill Size No. [Note (1)]
5.5 × 1.8	0.46	...	...	...	...	...	...
	0.61	4.70	4.22	19	...	...	...
	0.76	4.70	4.22	19	...	...	...
	0.91	4.70	4.22	19	...	...	...
	1.22	4.70	4.32	18	...	4.09	20
	1.52	...	4.50	16	...	4.22	19
	1.90	...	4.62	14	...	4.39	17
6.3 × 1.8	0.46	...	4.98	9	...	...	...
	0.61	...	4.98	9	...	...	...
	0.76	5.31	4.98	9	...	...	...
	0.91	5.31	4.98	9	...	...	...
	1.22	5.31	5.21	W	...	...	...
	1.52	...	5.79	1	...	5.05	8
	1.90	...	5.89	...	...	5.11	7
8 × 2.1 [Note (2)]	...	...	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...	...	...

GENERAL NOTES:

(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.

(b) Dimensions are in millimeters.

NOTES:

(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.

(2) Values for this nominal screw size and thread pitch are under development.

TABLE B2 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE AB THREAD-FORMING TAPPING SCREWS IN PLYWOODS (RESIN IMPREGNATED): COMPREG, PREGWOOD, ETC.

Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Material Thickness, Min.	Penetration in Blind Holes	
				Min.	Max.
2.2 × 0.8	1.85	49	3.18	4.78	12.70
2.9 × 1	2.54	39	4.78	6.35	15.88
3.5 × 1.3	3.18	...	4.78	6.35	15.88
4.2 × 1.4	3.66	27	4.78	6.35	19.05
4.8 × 1.6	4.39	17	6.35	7.92	25.40
5.5 × 1.8	4.93	10	7.92	9.52	25.40
6.3 × 1.8	5.79	1	7.92	9.52	25.40
8 × 2.1 [Note (2)]	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B3 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE AB THREAD-FORMING TAPPING SCREWS IN ASBESTOS COMPOSITIONS: TRANSITE, EBONY ASBESTOS, ETC.

Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Material Thickness, Min.	Penetration in Blind Holes	
				Min.	Max.
2.2 × 0.8	1.93	48	3.18	4.78	12.70
2.9 × 1	2.57	38	4.78	6.35	15.88
3.5 × 1.3	3.05	31	4.78	6.35	15.88
4.2 × 1.4	3.73	26	7.92	9.52	19.05
4.8 × 1.6	4.22	19	7.92	9.52	25.40
5.5 × 1.8	4.98	9	7.92	9.52	25.40
6.3 × 1.8	5.79	1	11.13	12.70	25.40
8 × 2.1 [Note (2)]	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B4 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE B THREAD-FORMING TAPPING SCREWS IN SHEET METALS

Nominal Screw Size and Thread Pitch	Metal Thickness	Steel, Stainless Steel, Monel, Brass: Pierced or Extruded Hole, Hole Diameter	Steel, Stainless Steel, Monel, Brass: Drilled or Clean-Punched Hole, Hole Diameter	Steel, Stainless Steel, Monel, Brass: Drilled or Clean-Punched Hole, Drill Size No. [Note (1)]	Aluminum Alloy: Pierced or Extruded Hole, Hole Diameter	Aluminum Alloy: Drilled or Clean-Punched Hole, Hole Diameter	Aluminum Alloy: Drilled or Clean-Punched Hole, Drill Size No. [Note (1)]
	0.38	...	1.63	52	...	...	...
	0.46	...	1.63	52	...	...	...
	0.61	...	1.70	51	...	1.63	52
2.2 × 0.8	0.76	...	1.78	50	...	1.63	52
	0.91	...	1.85	49	...	1.63	52
	1.22	...	1.85	49	...	1.70	51
	1.52	...	1.93	48	...	1.78	50
	0.38	2.18	2.18	44	...	...	...
	0.46	2.18	2.18	44	...	...	...
	0.61	2.49	2.26	43	2.18	...	...
	0.76	2.49	2.39	42	2.18	2.18	44
2.9 × 1	0.91	2.49	2.39	42	2.18	2.18	44
	1.22	...	2.44	41	2.18	2.18	44
	1.52	...	2.54	39	...	2.26	43
	1.90	...	2.59	38	...	2.26	43
	2.67	...	...	...	...	2.39	42
	0.38	2.82	2.64	37	...	...	...
	0.46	2.82	2.64	37	...	...	...
	0.61	2.82	2.69	36	2.82	...	...
	0.76	2.82	2.69	36	2.82	2.64	37
3.5 × 1.3	0.91	2.82	2.79	35	2.82	2.64	37
	1.22	...	2.82	34	2.82	2.64	37
	1.52	...	2.95	32	...	2.69	36
	1.90	...	3.05	31	...	2.79	35
	2.67	...	3.25	30	...	2.82	34
	3.25 to 6.35	...	...	...	...	3.05	31
	0.46	3.45	...	...	...	...	...
	0.61	3.45	3.18	...	3.45	...	...
	0.76	3.45	3.18	...	3.45	2.95	32
	0.91	3.45	3.18	...	3.45	3.05	31
	1.22	3.45	3.25	30	3.45	3.25	30
4.2 × 1.4	1.52	...	3.45	29	...	3.45	29
	1.90	...	3.56	28	...	3.56	28
	2.67	...	3.81	25	...	3.73	26
	3.18	...	3.81	25	...	3.73	26
	3.43	...	3.86	24	...	3.78	25
	4.11 to 9.52	...	...	...	...	3.86	24

(continued)

TABLE B4 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE B THREAD-FORMING TAPPING SCREWS IN SHEET METALS (CONT'D)

		Steel, Stainless Steel, Monel, Brass			Aluminum Alloy		
		Pierced or Extruded Hole, Hole Diameter	Drilled or Clean-Punched Hole		Pierced or Extruded Hole, Hole Diameter	Drilled or Clean-Punched Hole	
Nominal Screw Size and Thread Pitch	Metal Thickness		Hole Diameter	Drill Size No. [Note (1)]		Hole Diameter	Drill Size No. [Note (1)]
4.8 × 1.6	0.46	3.99	...	...	...	...	...
	0.61	3.99	3.66	27	3.99	...	...
	0.76	3.99	3.66	27	3.99	...	...
	0.91	3.99	3.73	26	3.99	3.66	27
	1.22	3.99	3.86	24	3.99	3.66	27
	1.52	...	3.86	24	...	3.66	27
	1.90	...	3.99	22	...	3.73	26
	2.67	...	4.09	20	...	3.73	26
	3.18	...	4.32	18	...	3.91	23
	3.43	...	4.32	18	...	3.91	23
	4.17	...	4.39	17	...	4.04	21
	5.08 to 9.52	...	...	...	...	4.22	19
5.5 × 1.8	0.61	4.70	4.22	19	...	...	...
	0.76	4.70	4.22	19	...	...	...
	0.91	4.70	4.22	19	...	...	...
	1.22	4.70	4.32	18	...	4.09	20
	1.52	...	4.50	16	...	4.22	19
	1.90	...	4.62	14	...	4.39	17
	2.67	...	4.70	13	...	4.57	15
	3.18	...	4.98	9	...	4.62	14
	3.43	...	4.98	9	...	4.62	14
	4.17	...	5.11	7	...	4.80	12
	5.08 to 9.52	...	...	...	...	4.98	9
6.3 × 1.8	0.76	5.31	4.93	10	...	...	...
	0.91	5.31	4.93	10	...	...	...
	1.22	5.31	4.93	10	...	...	...
	1.52	...	5.05	8	...	5.05	8
	1.90	...	5.18	6	...	5.11	7
	2.67	...	5.31	4	...	5.18	6
	3.18	...	5.79	1	...	5.31	4
	3.43	...	5.79	1	...	5.31	4
	4.17	...	5.94	...	...	5.41	3
	4.75	...	5.94	...	...	5.41	3
	4.93	...	5.94	...	...	5.61	2
	5.08 to 9.52	...	...	...	...	5.79	1
8 × 2.1 [Note (2)]	...	...	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B5 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE B THREAD-FORMING TAPPING SCREWS IN CAST METALS: ALUMINUM, MAGNESIUM, ZINC, BRASS, AND BRONZE

Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Penetration in Blind Holes, Min.
2.2 x 0.8	1.98	47	3.18
2.9 x 1	2.64	37	4.78
3.5 x 1.3	3.25	30	6.35
4.2 x 1.4	3.86	24	6.35
4.8 x 1.6	4.50	16	6.35
5.5 x 1.8	5.05	8	7.14
6.3 x 1.8	5.94	...	7.92
8 x 2.1 [Note (2)]	...	...	...
9.5 x 2.1 [Note (2)]	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B6 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE B THREAD-FORMING TAPPING SCREWS IN PLYWOODS (RESIN IMPREGNATED): COMPREG, PREGWOOD, ETC.

Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Material Thickness Min.	Penetration in Blind Holes	
				Min.	Max.
2.2 x 0.8	1.85	49	3.18	4.78	12.70
2.9 x 1	2.54	39	4.78	6.35	15.88
3.5 x 1.3	3.18	...	4.78	6.35	15.88
4.2 x 1.4	3.66	27	4.78	6.35	19.05
4.8 x 1.6	4.39	17	6.35	7.92	25.40
5.5 x 1.8	4.93	10	7.92	9.52	25.40
6.3 x 1.8	5.79	1	7.92	9.52	25.40
8 x 2.1 [Note (2)]	...	...	...	...	...
9.5 x 2.1 [Note (2)]	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B7 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE B THREAD-FORMING TAPPING SCREWS IN ASBESTOS COMPOSITIONS: TRANSITE, EBONY ASBESTOS, ETC.

Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Material Thickness, Min.	Penetration in Blind Holes Min.	Penetration in Blind Holes Max.
2.2 × 0.8	1.93	48	3.18	4.78	12.70
2.9 × 1	2.57	38	4.78	6.35	15.88
3.5 × 1.3	3.05	31	4.78	6.35	15.88
4.2 × 1.4	3.73	26	7.92	9.52	19.05
4.8 × 1.6	4.22	19	7.92	9.52	25.40
5.5 × 1.8	4.98	9	7.92	9.52	25.40
6.3 × 1.8	5.79	1	11.13	12.70	25.40
8 × 2.1 [Note (2)]	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B8 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPE B THREAD-FORMING TAPPING SCREWS IN PLASTICS

	Phenol Formaldehyde			Cellulose Acetate, Cellulose Nitrate, Acrylic Resin, and Styrene Resin		
Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Penetration in Blind Holes, Min.	Hole Diameter	Drill Size No. [Note (1)]	Penetration in Blind Holes, Min.
2.2 × 0.8	1.98	47	4.78	1.98	47	4.78
2.9 × 1	2.54	39	6.35	2.39	42	6.35
3.5 × 1.3	3.25	30	6.35	3.05	32	6.35
4.2 × 1.4	3.81	25	7.92	3.66	27	7.92
4.8 × 1.6	4.50	16	7.92	4.32	18	7.92
5.5 × 1.8	5.05	8	9.52	4.85	11	9.52
6.3 × 1.8	5.94	...	9.52	5.61	2	9.52
8 × 2.1 [Note (2)]	...	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

TABLE B9 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPES BF AND BT THREAD-FORMING CUTTING TAPPING SCREWS IN CAST METALS: DIE CAST ZINC AND ALUMINUM

Nominal Screw Size and Thread Pitch	Material Thickness	Hole Diameter	Drill Size No. [Note (1)]
	1.52	1.85	49
	2.11	1.85	49
2.2 × 0.8	2.77	1.93	48
	3.18	1.93	48
	3.56	1.93	48
	2.77	2.49	40
	3.18	2.54	39
2.9 × 1	3.56	2.54	39
	4.78	2.54	39
	6.35	2.59	38
	3.18	3.05	31
	3.56	3.05	31
3.5 × 1.3	4.78	3.05	31
	6.35	3.18	...
	7.92	3.18	...
	3.18	3.78	25
	3.56	3.78	25
4.2 × 1.4	4.78	3.78	25
	6.35	3.86	24
	7.92	3.86	24
	3.18	4.22	19
	3.56	4.22	19
	4.78	4.22	19
4.8 × 1.6	6.35	4.32	18
	7.92	4.37	...
	9.52	4.37	...
	3.18	4.85	11
	3.56	4.85	11
	4.78	4.85	11
5.5 × 1.8	6.35	4.98	9
	7.92	4.98	9
	9.52	4.98	9
	3.18	5.61	2
	3.56	5.61	2
	4.78	5.61	2
6.3 × 1.8	6.35	5.79	1
	7.92	5.79	1
	9.52	5.79	1

(continued)

TABLE B9 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPES BF AND BT THREAD-FORMING CUTTING TAPPING SCREWS IN CAST METALS: DIE CAST ZINC AND ALUMINUM (CONT'D)

Nominal Screw Size and Thread Pitch	Material Thickness	Hole Diameter	Drill Size No. [Note (1)]
8 × 2.1	3.18	7.14	K
	3.56	7.14	K
	4.78	7.14	K
	6.35	7.14	K
	7.92	7.37	L
	9.52	7.37	L
9.5 × 2.1	3.18	8.74	...
	3.56	8.74	...
	4.78	8.74	...
	6.35	8.74	...
	7.92	8.84	S
	9.52	8.84	S

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTE:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.

TABLE B10 APPROXIMATE INSTALLATION HOLE SIZES FOR STEEL TYPES BF AND BT THREAD-FORMING CUTTING TAPPING SCREWS IN PLASTICS

	Phenol Formaldehyde				Cellulose Acetate, Cellulose Nitrate, Acrylic Resin, and Styrene Resin			
Nominal Screw Size and Thread Pitch	Hole Diameter	Drill Size No. [Note (1)]	Depth of Penetration Min.	Depth of Penetration Max.	Hole Diameter	Drill Size No. [Note (1)]	Depth of Penetration Min.	Depth of Penetration Max.
2.2 × 0.8	1.98	...	2.39	6.35	1.93	48	2.39	6.35
2.9 × 1	2.64	37	3.18	7.92	2.54	39	3.18	7.92
3.5 × 1.3	3.18	...	4.78	9.52	3.05	31	4.78	9.52
4.2 × 1.4	3.73	26	6.35	12.70	3.66	27	6.35	12.70
4.8 × 1.6	4.32	18	7.92	15.88	4.22	19	7.92	15.88
5.5 × 1.8	4.93	10	9.52	15.88	4.80	12	9.52	15.88
6.3 × 1.8	5.79	1	9.52	19.05	5.61	2	9.52	19.05
8 × 2.1 [Note (2)]	...	...	...	...	...	...	...	...
9.5 × 2.1 [Note (2)]	...	...	...	...	...	...	...	...

GENERAL NOTES:
(a) Because conditions differ widely, it may be necessary to vary the hole size to best suit a particular application. Refer to the text on the first page of this Appendix.
(b) Dimensions are in millimeters.

NOTES:
(1) Customary drill size references have been retained where the metric hole diameters shown are direct conversions of the decimal inch equivalents thereof.
(2) Values for this nominal screw size and thread pitch are under development.

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