METRIC MACHINE SCREWS

IFI 513 1982

IFI Note:

The requirements given in this Standard for flat, oval, pan and hex head machine screws are in excellent agreement with ISO Standards. Hex flange machine screws have not yet been addressed by ISO technical committees nor have their dimensions been finalized by IFI or ASME technical committees. ASME Standards Committee B18 is currently preparing a standard for metric machine screws and when issued it will be designated ANSI B18.6.7M. The contents of this IFI-513 will be incorporated into ANSI B18.6.7M.

1. Scope.

1.1 This Standard covers the complete general and dimensional data for metric flat countersunk, oval countersunk and pan slotted and recessed head machine screws and metric hex and hex flange head machine screws recognized as standard. Also included are appendixes which provide specifications and instructions for protrusion gaging of flat countersunk head screws, across corners gaging of hex head screws and penetration gaging and wobble gaging of recessed head screws.

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. For recommended diameter-length combinations of machine screws see Table 11.

1.3 Comparison with ISO Standards. Flat countersunk, oval countersunk, pan and hex head machine screws as presented in this Standard have been coordinated to the extent possible with ISO Standards. The comparable ISO Standard(s) is listed in the footnotes of each product standard. The dimensional differences between machine screws covered in this Standard and those in ISO Standards are very few and relatively minor. None will affect the functional interchangeability of screws manufactured to the requirements of either.

1.3.1 Hex flange head screws and screws with thread Type III recess are not covered in ISO Standards.

1.3.2 Types 1 and 1A cross recesses of this Standard are designated Types H and Z respectively in ISO Standards.

1.3.3 Screw lengths 12 mm and 14 mm are ISO Standard lengths, 13 mm length is not (Table 11).

2. Introductory Notes.

2.1 Head Types. The head types covered by this Standard include those commonly recognized as being applicable to machine screws and are as follows:

2.1.1 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.

2.1.2 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.

2.1.3 Pan Head. The slotted pan head shall have a flat top surface rounded 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.

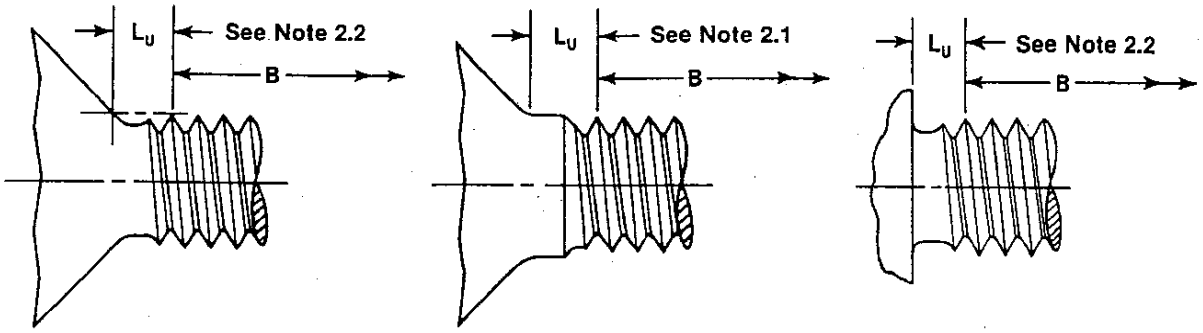
2.1.4 Hex Head. The hex head shall have a flat or indented top surface, six flat sides and a flat bearing surface.

2.1.5 Hex Flange Head. The hex flange head shall have an indented top surface and six flat sides formed integrally with a frustroconical or slightly rounded (convex) flange which projects beyond the sides and provides a flat bearing surface.

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

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

METRIC MACHINE SCREWS



Flat and Oval Countersunk Screws

(See Notes 2.1 and 2.2)

Recessed Head Heat Treated Flat Countersunk Screws

Pan, Hex and Hex Flange Head Screws

FIG. 1

Table 1 Thread Lengths

Nom Screw Dia and Thread Pitch	L	L_U		L		L_U		L	B
	Nom Screw Length	Unthreaded Length		Nom Screw Length		Unthreaded Length		Nom Screw Length	Full Form Thread Length
		See Note 2.1	See Note 2.2			See Note 2.1	See Note 2.2		
	≤ than	Max	Max	> than	≤ than	Max	Max	> than	Min
M2 × 0.4	6	1.0	0.4	6	30	1.0	0.8	30	25
M2.5 × 0.45	8	1.1	0.5	8	30	1.1	0.9	30	25
M3 × 0.5	9	1.2	0.5	9	30	1.2	1.0	30	25
M3.5 × 0.6	10	1.5	0.6	10	50	1.5	1.2	50	38
M4 × 0.7	12	1.8	0.7	12	50	1.8	1.4	50	38
M5 × 0.8	15	2.0	0.8	15	50	2.0	1.6	50	38
M6 × 1	18	2.5	1.0	18	50	2.5	2.0	50	38
M8 × 1.25	24	3.1	1.2	24	50	3.1	2.5	50	38
M10 × 1.5	30	3.8	1.5	30	50	3.8	3.0	50	38
M12 × 1.75	36	4.4	1.8	36	50	4.4	3.5	50	38

NOTES:

1. Refer to Note 3.4 of the General Data.
2. L_U is the distance from the underside of the head to the face of a non-chamfered or non-counterbored standard GO thread ring gage assembled by hand as far as the thread will permit.
   2.1 L_U values apply only to recessed head heat treated flat countersunk screws.
   2.2 L_U values apply to all screws except those excluded in 2.1.

2.4 Terminology. For definitions of terms relating to fasteners or component features used in this Standard, refer to the American National Standard, Glossary of Terms for Mechanical Fasteners, ANSI B18.12, an abstract of which is presented on page J—5.

3. General Data.

3.1 Heads.

3.1.1 Height of Head. The height of head indicated in the dimensional tables represents a metal to metal measurement. In other words, on heads having rounded top surfaces, the truncation of the rounded surface due to recess or slot is not considered part of the head height.

On countersunk type heads, the height of head is a reference dimension measured parallel to the axis of the screw from the largest diameter of the bearing surface of the head to the point of intersection of the bearing surface of the head and basic major diameter of the screw. This point of intersection may not necessarily be the same as the actual junction of head and shank.

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

3.1.3 Depth of Recess. The depth of recess in recessed head screws shall be measured parallel to the axis of the screw from the intersection of the maximum diameter of Types 1 and 1A recesses and the square sides of Type III recess with the head surface to the bottom of the recess.

Recess penetration gaging depth values are included in the dimensional tables and the method of gaging and specifications for gages are covered in Appendix C of IFI-502, page F—22.

Recess wobble gaging procedures and operating limits are given in Appendix D of IFI-502, page F—25.

3.1.4 Depth of Slot. The depth of slot 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.

3.1.5 Positional Tolerances. The positional relationship between the heads and driving provisions of screws and the shanks of screws (formerly defined as Eccentricity) shall be as follows:

3.1.5.1 Position of Head. 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 percent of the specified maximum head diameter, or the specified maximum width across flats of hex and hex flange heads, regardless of feature size.

3.1.5.2 Position of Recess. The recess in cross or square 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 percent of the basic screw diameter or 0.75 mm, whichever is greater, regardless of feature size.

3.1.5.3 Position of Slot. 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 diameter equivalent to 12 percent of the basic screw diameter or 0.50 mm, whichever is greater, regardless of feature size.

3.1.6 Underhead Fillets. All screws shall have a fillet radius at the junction of the head to shank within the limits as specified in the dimensional tables. For flat and oval countersunk head screws, the maximum fillet radius equals 0.4D and minimum radius equals 0.2D, rounded to one decimal place. For pan, hex and hex flange screws, the fillet shall be a smooth and continuous curve fairing smoothly into the under head 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 R minimum.

3.2 Length.

3.2.1 Measurement. The length of screw shall be measured parallel to the axis of the screw from the extreme point to the largest diameter of the bearing surface of the head. Recommended lengths of machine screws are given in Table 11.

3.2.2 Tolerance on Length. The tolerance on length of screws shall conform to the following:

Nom Screw Length	Tolerance on Length mm
to 3 mm incl.	0.2
over 3 to 10 mm	0.3
over 10 to 16 mm	0.4
over 16 to 50 mm	0.5
over 50 mm	1.0

All tolerances are plus and minus.

3.3 Threads and Thread Gaging.

3.3.1 Threads shall be metric coarse thread

METRIC MACHINE SCREWS

series conforming to dimensions for general purpose external threads given in ANSI B1.13M, page A—8, unless otherwise specified by the purchaser. Class 6g tolerances shall apply to plain finish (unplated or uncoated) screws of all nominal thread diameters and to plated or coated screws before plating or coating for screws of nominal thread diameters M5 and larger. For screws of nominal thread diameters M4 and smaller which are to be plated or coated, class 6g tolerances shall apply before plating or coating, except that the allowance shall be increased to 0.024 mm and the maximum thread diameters adjusted accordingly. For screws with additive finish, the 6g diameters may be exceeded by the amount of the allowance, i.e., the basic diameters shall apply to screws after plating or coating.

3.3.2 Unless otherwise specified by the purchaser, gaging for screw thread dimensional acceptability shall be in accordance with gaging System 21 as specified in ANSI B1.3M, page A—35.

3.4 Length of Thread. The length of thread on machine screws shall be as specified in Table 1 for the applicable screw type, size and length. For screws which are threaded full length the minimum and maximum unthreaded length under the head shall be controlled as specified in Table 1. Thread length, B, is the distance, measured parallel to the axis of the screw from the extreme end of screw to the last complete (full form) thread. See Tables 2, 4, 6, 8 and 9.

3.5 Points. Unless otherwise specified, machine screws shall have plain sheared ends. When specified, header points shall be obtainable as shown in Table 10. Other points or pointing of longer lengths to header point dimensions may require machining.

3.6 Diameter of Body. The diameter of the body of machine screws shall be within the limits specified in the dimensional tables.

3.7 Material. Low carbon steel machine screws shall conform to the requirements of property class 4.8, and heat-treated carbon steel screws shall conform to the requirements of property class 9.8 as covered in ASTM F568, page B—1. Hex and hex flange screws shall be marked on the top of the head with the property class numerals. Other head types need not be marked.

Machine screws may also be made from higher strength steels, corrosion resistant steel, brass, monel, aluminum alloys or other materials, as agreed upon between the manufacturer and the purchaser. (For guidance refer to ASTM F738, page B—19, and ASTM F468M, page B—34.)

3.8 Finish. Unless otherwise specified, machine screws shall be supplied with a naturally bright unplated or uncoated finish. When corrosion preventative treatment is required, screws shall be plated or coated as agreed upon between the manufacturer and purchaser. However, where heat treated carbon steel screws are plated or coated and subject to hydrogen embrittlement, they shall be suitably treated subsequent to the plating or coating operation to obviate such embrittlement.

3.9 Clearance Holes. Recommended nominal diameters of clearance holes in material to be assembled using machine screws are given in IFI-527, page J—21.

3.10 Designation. Machine screws shall be designated by the following data in the sequence shown: Nominal size and thread pitch; nominal length; product name, including head type and driving provision; header point, if desired; material (and property class, if steel); and protective finish, if required. See examples below:

M8 × 1.25 × 30 Slotted Pan Head Machine Screw, Class 4.8 steel, Zinc Plated.

M3.5 × 0.6 × 20 Type 1A Cross Recessed Oval Countersunk Head Machine Screw, Header Pointed, Brass.

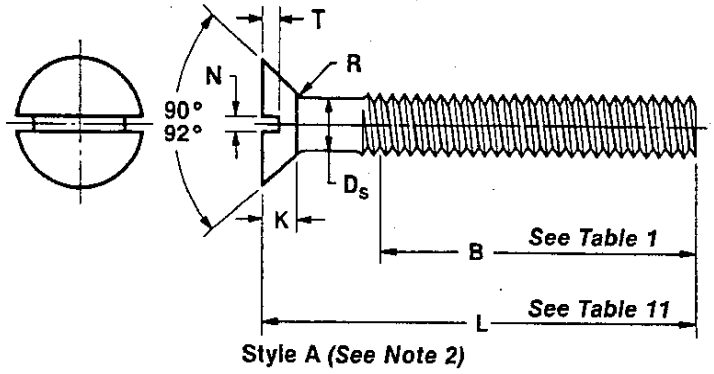
4. Inspection.

4.1 Inspection and Quality Assurance. Unless otherwise specified by the purchaser in the original inquiry and purchase order, acceptability shall be based on conformance with the requirements specified in ANSI B18.18.1M, page J—25.

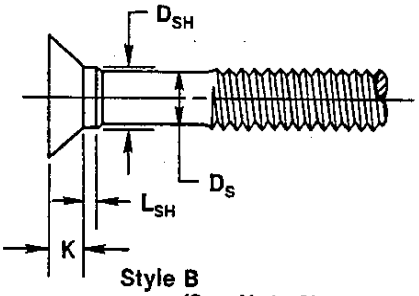
MACHINE SCREWS

METRIC MACHINE SCREWS

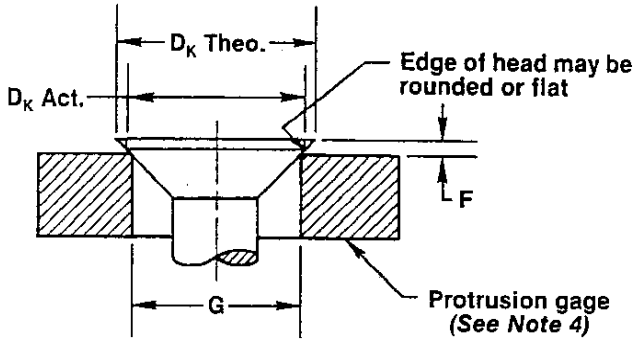
IFI 513 1982



Style A *(See Note 2)*



Style B *(See Note 2)*



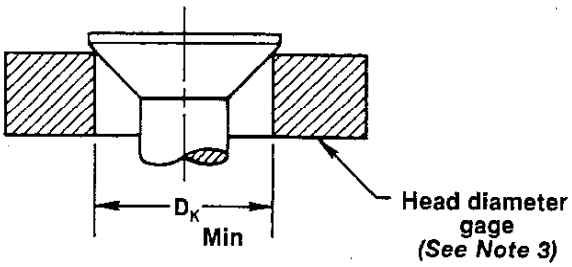
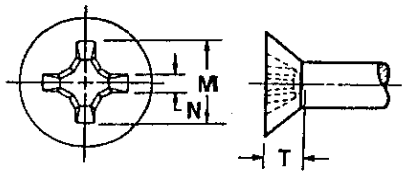


Table 2 Slotted Flat Countersunk Head Machine Screws

Nom Screw Size and Thread Pitch	D_S Body Dia		D_{SH} Shoulder Dia		D_K Head Dia			K Head Height	L_{SH} Shoulder Length		R Fillet Radius		N Slot Width		T Slot Depth		F Protrusion of Head Above Gage Dia		G Gage Dia
					Theoretical Sharp		Actual												
	Max	Min	Max	Min	Max	Min	Min	Max Ref	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
M2 × 0.4	2.00	1.65	2.00	1.86	4.4	4.1	3.5	1.2	0.50	0.30	0.8	0.4	0.7	0.5	0.6	0.4	0.79	0.62	2.82
M2.5 × 0.45	2.50	2.12	2.50	2.36	5.5	5.1	4.4	1.5	0.55	0.35	1.0	0.5	0.8	0.6	0.7	0.5	0.88	0.66	3.74
M3 × 0.5	3.00	2.58	3.00	2.86	6.3	5.9	5.2	1.7	0.60	0.40	1.2	0.6	1.0	0.8	0.9	0.6	0.83	0.60	4.65
M3.5 × 0.6	3.50	3.00	3.50	3.32	8.2	7.7	6.9	2.3	0.70	0.50	1.4	0.7	1.2	1.0	1.2	0.9	1.32	1.03	5.57
M4 × 0.7	4.00	3.43	4.00	3.82	9.4	8.9	8.0	2.7	0.80	0.60	1.6	0.8	1.5	1.2	1.3	1.0	1.46	1.17	6.48
M5 × 0.8	5.00	4.36	5.00	4.82	10.4	9.8	8.9	2.7	0.90	0.70	2.0	1.0	1.5	1.2	1.4	1.1	1.05	0.72	8.31
M6 × 1	6.00	5.21	6.00	5.82	12.6	11.9	10.9	3.3	1.10	0.90	2.4	1.2	1.9	1.6	1.6	1.2	1.23	0.85	10.14
M8 × 1.25	8.00	7.04	8.00	7.78	17.3	16.5	15.4	4.6	1.40	1.10	3.2	1.6	2.3	2.0	2.3	1.8	1.75	1.30	13.80
M10 × 1.5	10.00	8.86	10.00	9.78	20.0	19.2	17.8	5.0	1.70	1.30	4.0	2.0	2.8	2.5	2.6	2.0	2.23	1.77	15.54
See Notes			2				3		2								4		

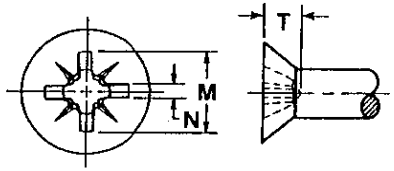
NOTES:

1. See Introductory Notes and General Data, page F—44.
2. Recessed head (Table 3) heat treated steel screws of property class 9.8 or higher strength shall have Style B head form. All slotted head screws of all materials and all recessed head screws, other than those specifically designated to be Style B, shall have Style A head form. The underhead shoulder on Style B is mandatory, other head dimensions are the same for Styles A and B.
3. Acceptability of minimum head diameter shall be determined by using a plain ring gage having a hole diameter equal to the specified actual D_K minimum within a tolerance of plus 0.00 mm and minus 0.01 mm. The head shall not enter the gage.
4. 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 given in Appendix A of IFI-502, page F—20.
5. Comparable ISO Standards —
   ISO 2009 — Slotted countersunk head screws.
   ISO 7046 — Recessed countersunk head screws — property class 4.8.



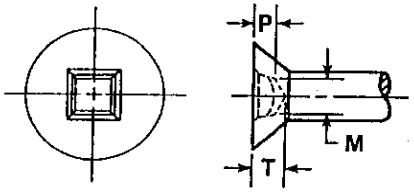
Type I

This type of recess has a large center opening, tapered wings, and blunt bottom, with all edges relieved or rounded.



Type 1A

This type of recess has a large center opening, wide straight wings, and blunt bottom, with all edges relieved or rounded.



Type III

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.

Table 3 Recess Dimensions of Flat Countersunk Head Machine Screws

Nom Screw Size	Type 1								Type 1A								Type III						
	M		T		N	Driver Size	Recess Penetration Gaging Depth		M		T		N	Driver Size	Recess Penetration Gaging Depth		M		T		Driver Size	P	
	Recess Dia		Recess Depth		Recess Width				Recess Dia		Recess Depth		Recess Width				Recess Square		Recess Depth			Penetration Gaging Depth	
	Max	Min	Max	Min	Min		Max	Min	Max	Min	Max	Min	Min		Max	Min	Max	Min	Max	Min		Max	Min
M 2	2.31	1.98	1.69	1.39	0.53	0	1.55	1.25	2.37	2.04	1.74	1.39	0.47	0	1.55	1.20	—	—	—	—	—	—	—
M 2.5	2.97	2.64	1.98	1.58	0.74	1	1.80	1.40	2.94	2.61	2.03	1.63	0.73	1	1.75	1.35	1.80	1.77	1.86	1.59	0	0.96	0.81
M 3	3.27	2.94	2.28	1.88	0.79	1	2.10	1.70	3.24	2.91	2.28	1.88	0.73	1	2.00	1.60	1.80	1.77	1.86	1.59	0	0.96	0.81
M 3.5	4.22	3.89	2.50	2.00	0.91	2	2.20	1.70	4.31	3.98	2.61	2.16	1.03	2	2.20	1.75	2.32	2.29	2.98	2.56	1	1.65	1.45
M 4	4.62	4.29	2.90	2.40	0.96	2	2.60	2.10	4.60	4.27	2.90	2.45	1.03	2	2.50	2.05	2.86	2.82	3.55	3.03	2	1.91	1.65
M 5	5.22	4.89	3.50	3.00	1.04	2	3.20	2.70	5.15	4.82	3.46	3.01	1.04	2	3.05	2.60	2.86	2.82	3.65	3.13	2	2.01	1.75
M 6	6.79	6.46	3.96	3.46	1.12	3	3.50	3.00	6.82	6.49	4.01	3.56	1.44	3	3.45	3.00	3.38	3.34	4.36	3.73	3	2.41	2.11
M 8	8.95	8.62	5.18	4.58	1.80	4	4.60	4.00	8.98	8.65	5.29	4.84	2.18	4	4.60	4.15	4.86	4.81	5.39	4.62	4	2.59	2.29
M10	10.05	9.72	6.28	5.68	1.98	4	5.70	5.10	10.01	9.68	6.34	5.89	2.19	4	5.65	5.20	4.86	4.81	5.79	5.03	4	3.00	2.69

NOTES:

1. Head dimensions not shown are the same as those of slotted heads given in Table 2.
2. For penetration gaging, see Appendix C of IFI-502, page F—22.
3. For wobble gaging, see Appendix D of IFI-502, page F—25.
4. See Introductory Notes and General Data, page F—44.

METRIC MACHINE SCREWS

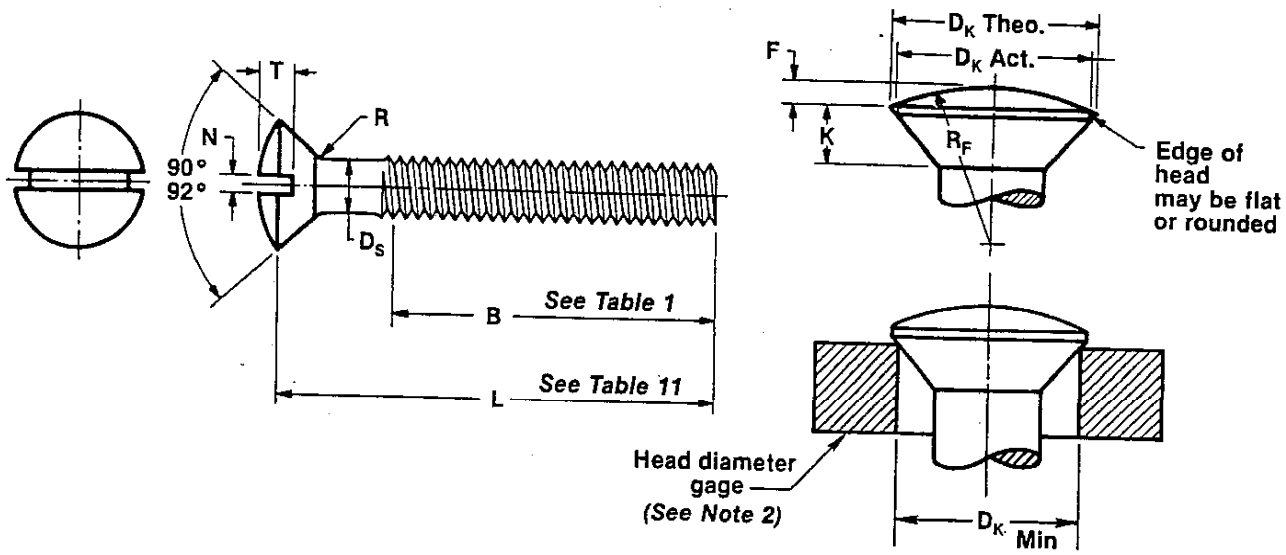
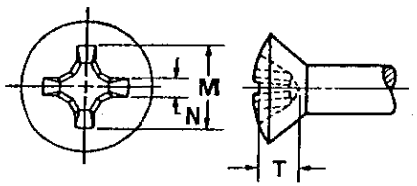


Table 4 Slotted Oval Countersunk Head Machine Screws

Nom Screw Size and Thread Pitch	D_S		D_K			K	F	R_F	R		N		T	
	Body Dia		Head Dia			Head Side Height	Raised Head Height	Head Radius	Fillet Radius		Slot Width		Slot Depth	
			Theoretical Sharp		Actual									
	Max	Min	Max	Min	Min	Max Ref	Max	Approx	Max	Min	Max	Min	Max	Min
M2 × 0.4	2.00	1.65	4.4	4.1	3.5	1.2	0.5	5.0	0.8	0.4	0.7	0.5	1.0	0.8
M2.5 × 0.45	2.50	2.12	5.5	5.1	4.4	1.5	0.6	6.6	1.0	0.5	0.8	0.6	1.2	1.0
M3 × 0.5	3.00	2.58	6.3	5.9	5.2	1.7	0.7	7.4	1.2	0.6	1.0	0.8	1.5	1.2
M3.5 × 0.6	3.50	3.00	8.2	7.7	6.9	2.3	0.8	10.9	1.4	0.7	1.2	1.0	1.7	1.4
M4 × 0.7	4.00	3.43	9.4	8.9	8.0	2.7	1.0	11.6	1.6	0.8	1.5	1.2	1.9	1.6
M5 × 0.8	5.00	4.36	10.4	9.8	8.9	2.7	1.2	11.9	2.0	1.0	1.5	1.2	2.4	2.0
M6 × 1	6.00	5.21	12.6	11.9	10.9	3.3	1.4	14.9	2.4	1.2	1.9	1.6	2.8	2.4
M8 × 1.25	8.00	7.04	17.3	16.5	15.4	4.6	2.0	19.7	3.2	1.6	2.3	2.0	3.7	3.2
M10 × 1.5	10.00	8.86	20.0	19.2	17.8	5.0	2.3	22.9	4.0	2.0	2.8	2.5	4.4	3.8
See Notes					2									

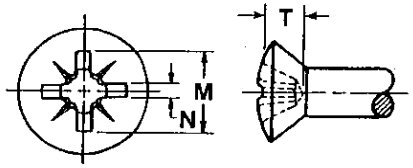
NOTES:

1. See Introductory Notes and General Data, page F—44.
2. Acceptability of minimum head diameter shall be determined by using a plain ring gage having a hole diameter equal to the specified actual D_K minimum within a tolerance of plus 0.00 mm and minus 0.01 mm. The head shall not enter the gage.
3. Comparable ISO Standards —
   ISO 2010 — Slotted raised countersunk head screws.
   ISO 7047 — Recessed raised countersunk head screws.



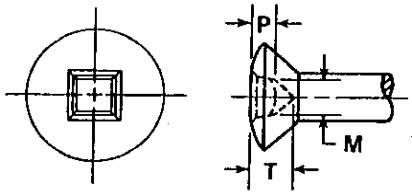
Type I

This type of recess has a large center opening, tapered wings, and blunt bottom, with all edges relieved or rounded.



Type 1A

This type of recess has a large center opening, wide straight wings, and blunt bottom, with all edges relieved or rounded.



Type III

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.

Table 5 Recess Dimensions of Oval Countersunk Head Machine Screws

Nom Screw Size	Type 1								Type 1A								Type III							
	M		T		N	Driver Size	Recess Penetration Gaging Depth		M		T		N	Driver Size	Recess Penetration Gaging Depth		M		T		Driver Size	P	
	Recess Dia		Recess Depth		Recess Width				Recess Dia		Recess Depth		Recess Width				Recess Square		Recess Depth			Penetration Gaging Depth	
	Max	Min	Max	Min	Min		Max	Min	Max	Min	Max	Min	Min		Max	Min	Max	Min	Max	Min		Max	Min
M 2	2.52	2.19	1.84	1.54	0.56	0	1.70	1.40	2.56	2.23	1.90	1.55	0.48	0	1.72	1.37	—	—	—	—	—	—	—
M 2.5	3.22	2.89	2.15	1.75	0.77	1	1.96	1.56	2.78	2.45	2.14	1.74	0.73	1	1.98	1.58	1.80	1.77	1.86	1.59	0	0.96	0.81
M 3	3.61	3.28	2.53	2.13	0.83	1	2.43	2.03	3.15	2.82	2.51	2.11	0.74	1	2.32	1.92	1.80	1.77	1.86	1.59	0	0.96	0.81
M 3.5	4.54	4.21	2.73	2.23	0.94	2	2.43	1.93	4.62	4.29	2.68	2.43	1.03	2	2.48	2.03	2.32	2.29	2.98	2.56	1	1.65	1.45
M 4	5.09	4.76	3.24	2.74	1.01	2	2.98	2.48	5.07	4.74	3.33	2.88	1.04	2	2.93	2.48	2.86	2.82	3.55	3.03	2	1.91	1.65
M 5	5.82	5.49	3.99	3.49	1.10	2	3.69	3.19	5.74	5.41	4.00	3.55	1.05	2	3.60	3.15	2.86	2.82	3.65	3.13	2	2.01	1.75
M 6	7.47	7.14	4.51	4.01	1.19	3	4.05	3.55	7.48	7.15	4.61	4.16	1.45	3	4.05	3.60	3.38	3.34	4.36	3.73	3	2.41	2.11
M 8	10.02	9.69	6.11	5.51	1.95	4	5.53	4.93	10.06	9.73	6.31	5.86	2.19	4	5.62	5.17	4.86	4.81	5.39	4.62	4	2.59	2.29
M10	11.41	11.08	7.45	6.85	2.17	4	6.87	6.27	11.34	11.01	7.61	7.16	2.20	4	6.92	6.47	4.86	4.81	5.79	5.03	4	3.00	2.69

NOTES:

1. Head dimensions not shown are the same as those of slotted heads given in Table 4.
2. For penetration gaging, see Appendix C of IFI-502, page F—22.
3. For wobble gaging, see Appendix D of IFI-502, page F—25.
4. See Introductory Notes and General Data, page F—44.

METRIC MACHINE SCREWS

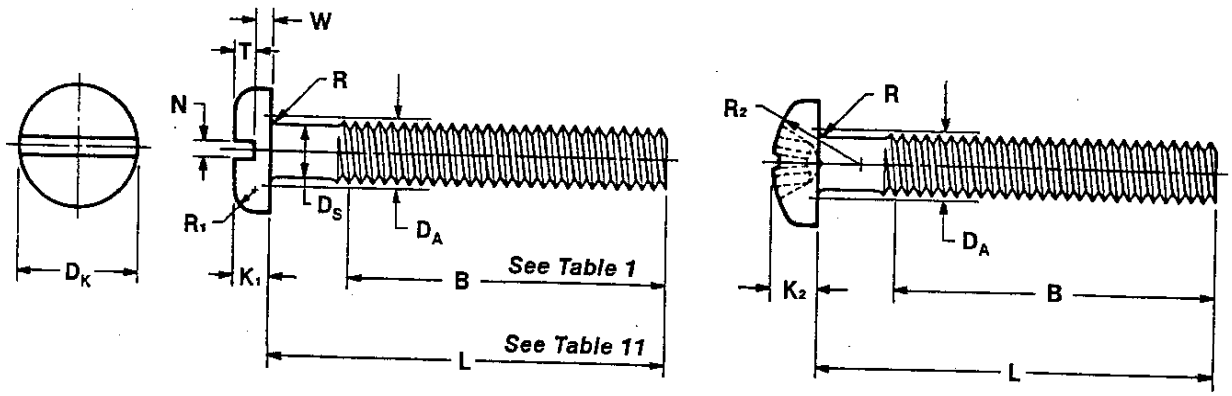
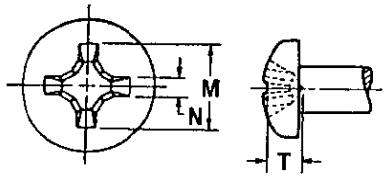


Table 6 Slotted and Recessed Pan Head Machine Screws

Nom Screw Size and Thread Pitch	D_S		D_K		K_1		K_2		R_1	R_2	D_A	R	N		T	W
	Body Dia		Head Dia		Head Height				Head Radius (Sltd)	Head Radius (Rcssd)	Fillet Transition Dia	Fillet Radius	Slot Width		Slot Depth	Unslotted Thickness
					Slotted Head		Recessed Head									
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Ref	Max	Min	Max	Min	Min	Min
M2 × 0.4	2.00	1.65	4.0	3.7	1.3	1.1	1.6	1.4	0.8	3.2	2.6	0.1	0.7	0.5	0.5	0.4
M2.5 × 0.45	2.50	2.12	5.0	4.7	1.5	1.3	2.1	1.9	1.0	4.0	3.1	0.1	0.8	0.6	0.6	0.5
M3 × 0.5	3.00	2.58	5.6	5.3	1.8	1.6	2.4	2.2	1.2	5.0	3.6	0.1	1.0	0.8	0.7	0.7
M3.5 × 0.6	3.50	3.00	7.0	6.6	2.1	1.9	2.6	2.3	1.4	6.0	4.1	0.1	1.2	1.0	0.8	0.8
M4 × 0.7	4.00	3.43	8.0	7.6	2.4	2.2	3.1	2.8	1.6	6.5	4.7	0.2	1.5	1.2	1.0	0.9
M5 × 0.8	5.00	4.36	9.5	9.1	3.0	2.7	3.7	3.4	2.0	8.0	5.7	0.2	1.5	1.2	1.2	1.2
M6 × 1	6.00	5.21	12.0	11.5	3.6	3.3	4.6	4.3	2.5	10.0	6.8	0.3	1.9	1.6	1.4	1.4
M8 × 1.25	8.00	7.04	16.0	15.5	4.8	4.5	6.0	5.6	3.2	13.0	9.2	0.4	2.3	2.0	1.9	1.9
M10 × 1.5	10.00	8.86	20.0	19.4	6.0	5.7	7.5	7.1	4.0	16.0	11.2	0.4	2.8	2.5	2.4	2.4
See Notes																

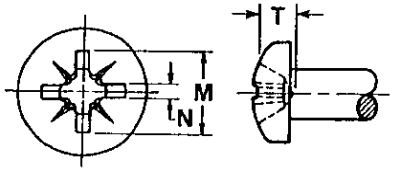
NOTES:

1. See Introductory Notes and General Data, page F—44.
2. Comparable ISO Standards —
   ISO 1580 — Slotted pan head screws.
   ISO 7045 — Recessed pan head screws.



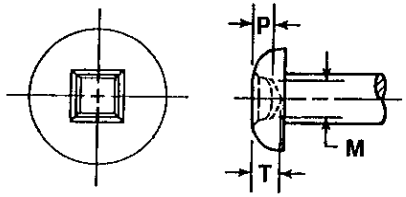
Type I

This type of recess has a large center opening, tapered wings, and blunt bottom, with all edges relieved or rounded.



Type 1A

This type of recess has a large center opening, wide straight wings, and blunt bottom, with all edges relieved or rounded.



Type III

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.

Table 7 Recess Dimensions of Pan Head Machine Screws

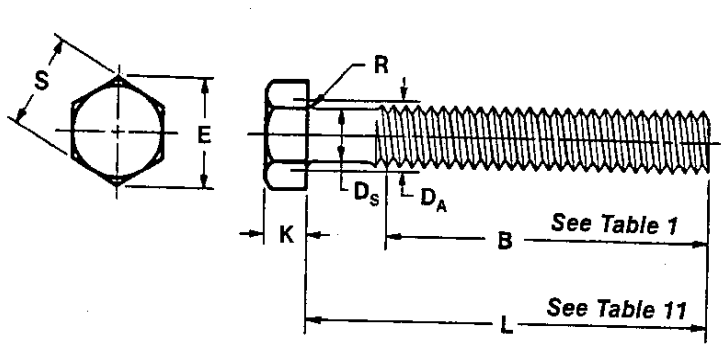
Nom Screw Size	Type 1								Type 1A								Type III						
	M		T		N	Driver Size	Recess Penetration Gaging Depth		M		T		N	Driver Size	Recess Penetration Gaging Depth		M		T		Driver Size	P	
	Recess Dia		Recess Depth		Recess Width				Recess Dia		Recess Depth		Recess Width				Recess Square		Recess Depth			Penetration Gaging Depth	
	Max	Min	Max	Min	Min		Max	Min	Max	Min	Max	Min	Min		Max	Min	Max	Min	Max	Min		Max	Min
M 2	1.99	1.66	1.34	1.04	0.48	0	1.20	0.95	2.08	1.75	1.40	1.05	0.47	0	1.20	0.85	—	—	—	—	—	—	—
M 2.5	2.85	2.52	1.73	1.33	0.70	1	1.55	1.15	2.79	2.46	1.78	1.38	0.73	1	1.50	1.10	1.80	1.77	1.86	1.59	0	0.96	0.81
M 3	3.06	2.73	1.96	1.56	0.74	1	1.80	1.40	3.03	2.70	2.03	1.63	0.73	1	1.75	1.35	1.80	1.77	1.86	1.59	0	0.96	0.81
M 3.5	4.08	3.75	2.20	1.70	0.87	2	1.90	1.40	4.06	3.73	2.36	1.91	1.03	2	1.90	1.45	2.32	2.29	2.98	2.56	1	1.65	1.45
M 4	4.57	4.24	2.70	2.20	0.93	2	2.40	1.90	4.53	4.20	2.76	2.31	1.03	2	2.35	1.90	2.86	2.82	3.55	3.03	2	1.91	1.65
M 5	5.07	4.74	3.20	2.70	1.00	2	2.90	2.40	4.92	4.59	3.16	2.71	1.04	2	2.75	2.30	2.86	2.82	3.65	3.13	2	2.01	1.75
M 6	7.09	6.76	4.06	3.56	1.14	3	3.60	3.10	6.97	6.64	4.07	3.62	1.44	3	3.50	3.05	3.38	3.34	4.36	3.73	3	2.41	2.11
M 8	9.18	8.85	5.18	4.58	1.69	4	4.60	4.00	8.98	8.65	5.19	4.74	2.18	4	4.50	4.05	4.86	4.81	5.39	4.62	4	2.59	2.29
M10	10.35	10.02	6.39	5.79	1.84	4	5.80	5.20	10.20	9.87	6.39	5.94	2.19	4	5.70	5.25	4.86	4.81	5.79	5.03	4	3.00	2.69

NOTES:

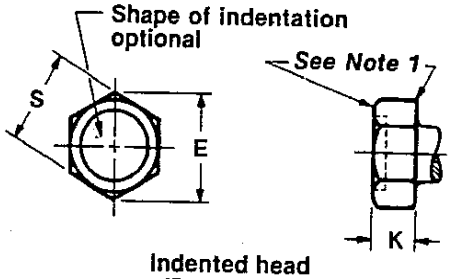
1. Head dimensions not shown are the same as those of slotted heads given in Table 6.
2. For penetration gaging, see Appendix C of IFI-502, page F—22.
3. For wobble gaging, see Appendix D of IFI-502, page F—25.
4. See Introductory Notes and General Data, page F—44.

METRIC MACHINE SCREWS

IFI 513 1982



Trimmed head or fully upset head
(See Note 5)



Indented head
(See Note 5)

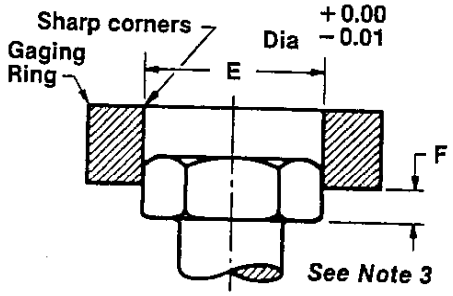


Table 8 Hex Head Machine Screws

Nom Screw Size and Thread Pitch	D_S Body Dia		S Width Across Flats		E Width Across Corners	K Head Height		D_A Fillet Transition Dia	R Fillet Radius	F Protrusion Beyond Gaging Ring
	Max	Min	Max	Min	Min	Max	Min	Max	Min	Min
M2 × 0.4	2.00	1.65	3.20	3.02	3.38	1.6	1.3	2.6	0.1	0.78
M2.5 × 0.45	2.50	2.12	4.00	3.82	4.28	2.1	1.8	3.1	0.1	1.08
M3 × 0.5	3.00	2.58	5.00	4.82	5.40	2.3	2.0	3.6	0.1	1.20
M3.5 × 0.6	3.50	3.00	5.50	5.32	5.96	2.6	2.3	4.1	0.1	1.38
M4 × 0.7	4.00	3.43	7.00	6.78	7.59	3.0	2.6	4.7	0.2	1.56
M5 × 0.8	5.00	4.36	8.00	7.78	8.71	3.8	3.3	5.7	0.2	1.98
M6 × 1	6.00	5.21	10.00	9.78	10.95	4.7	4.1	6.8	0.3	2.46
M8 × 1.25	8.00	7.04	13.00	12.73	14.26	6.0	5.2	9.2	0.4	3.12
M10 × 1.5	10.00	8.86	16.00	15.73	17.62	7.5	6.5	11.2	0.4	3.90
M12 × 1.75	12.00	10.68	18.00	17.73	19.86	9.0	7.8	13.2	0.4	4.68
See Notes			2,3		2					3
*M10 × 1.5	10.00	8.86	15.00	14.73	16.50	7.5	6.5	11.2	0.4	3.90

NOTES:

1. A slight rounding of all edges of the hex surfaces of indented hex heads is permissible provided the diameter of the bearing circle is not less than 90 percent of the minimum width across flats dimension.
2. Dimensions across flats and across corners of the head shall be measured at the point of maximum metal. Taper of sides of hex (angle between one side and the axis) shall not exceed 2 deg or 0.10 mm whichever is greater, the specified width across flats being the large dimension.
3. The rounding due to lack of fill on all six corners of the head shall be reasonably uniform, and 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 is placed on the top and bottom of the head, the head shall protrude by an amount equal to, or greater than, the F value tabulated. For across corners gaging see Appendix B of IFI-502, page F—21.
4. There is no ISO Standard for hex head machine screws.
5. Heads may be indented, trimmed or fully upset at the option of the manufacturer.
6. See Introductory Notes and General Data, page F—44.

*M10 screws with 15 mm width across flats are not ISO Standard. Unless M10 screws with 15 mm width across flats are specifically ordered, M10 screws with 16 mm width across flats shall be furnished.

METRIC MACHINE SCREWS

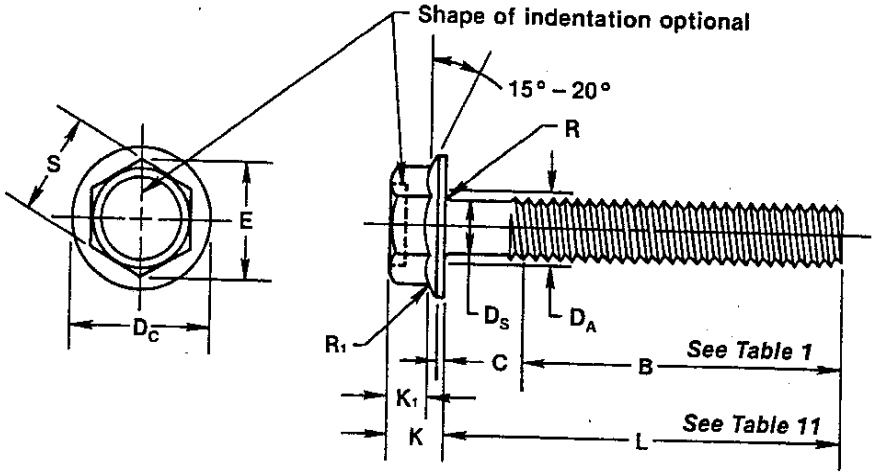


Table 9 Hex Flange Head Machine Screws

Nom Screw Size and Thread Pitch	D_S Body Dia		S Width Across Flats		E Width Across Corners	D_C Flange Dia		C Flange Edge Thickness	R_1 Flange Top Fillet Radius	K Head Height	K_1 Hex Height	D_A Fillet Transition Dia	R Fillet Radius
	Max	Min	Max	Min	Min	Max	Min	Min	Max	Max	Min	Max	Min
M2 × 0.4	2.00	1.65	3.00	2.84	3.16							2.6	0.1
M2.5 × 0.45	2.50	2.12	3.20	3.04	3.39							3.1	0.1
M3 × 0.5	3.00	2.58	4.00	3.84	4.27							3.6	0.1
M3.5 × 0.6	3.50	3.00	5.00	4.82	5.36							4.1	0.1
M4 × 0.7	4.00	3.43	5.50	5.32	5.92							4.7	0.2
M5 × 0.8	5.00	4.36	7.00	6.78	7.55							5.7	0.2
M6 × 1	6.00	5.21	8.00	7.78	8.66							6.8	0.3
M8 × 1.25	8.00	7.04	10.00	9.78	10.89							9.2	0.4
M10 × 1.5	10.00	8.86	13.00	12.72	14.16							11.2	0.4
M12 × 1.75	12.00	10.68	15.00	14.72	16.38							13.2	0.4
See Notes													

These dimensions are under development

NOTES:

1. See Introductory Notes and General Data, page F—44.
2. There is no ISO Standard for hex flange head machine screws.

METRIC MACHINE SCREWS

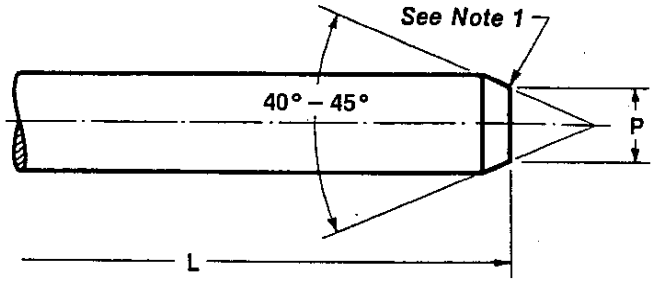


Table 10 Header Points for Machine Screws Before Threading

Nom Screw Size	P		L
	Point Dia		Nom Screw Length
	Max	Min	Max
M2 × 0.4	1.33	1.21	13
M2.5 × 0.45	1.73	1.57	13
M3 × 0.5	2.12	1.93	16
M3.5 × 0.6	2.46	2.24	20
M4 × 0.7	2.80	2.55	25
M5 × 0.8	3.60	3.28	30
M6 × 1	4.25	3.85	40
M8 × 1.25	5.82	5.30	40
M10 × 1.5	7.36	6.71	40
M12 × 1.75	8.90	8.11	45
See Notes			2

NOTES:

1. Edges of point may be rounded and end of point need not be flat nor perpendicular to axis of shank.
2. Header points apply to these nominal lengths or shorter. The pointing of longer lengths may require machining to the dimensions specified.
3. See General Data on page F—44.

Table 11 Recommended Machine Screw Lengths

Nom Screw Length	Nom Screw Size									
	M2	M2.5	M3	M3.5	M4	M5	M6	M8	M10	M12
2.5	P									
3	A	P								
4	A	A	P							
5	A	A	A	P	P					
6	A	A	A	A	A	P				
8	A	A	A	A	A	A	A			
10	A	A	A	A	A	A	A	A		
13	A	A	A	A	A	A	A	A	A	
16	A	A	A	A	A	A	A	A	A	H
20	A	A	A	A	A	A	A	A	A	H
25		A	A	A	A	A	A	A	A	H
30			A	A	A	A	A	A	A	H
35				A	A	A	A	A	A	H
40					A	A	A	A	A	H
45						A	A	A	A	H
50						A	A	A	A	H
55							A	A	A	H
60							A	A	A	H
65								A	A	H
70								A	A	H
80								A	A	H
90									A	H

NOTE:

Lengths included between the heavy lines are recommended for the applicable screw size and head style. 'A' means screws of all head styles; 'P' means pan head screws; and 'H' means hex and hex flange head screws.