



WORLDWIDE STANDARD

WB 900

DATE: 1996 JULY

General and Dimensional Requirements of Pan Head, Raised Countersunk Head and Flat Countersunk Head Machine Screws, and Machine Screw and Tooth Washer Assemblies

1. SCOPE.

This standard specifies the general and dimensional requirements of pan head, raised countersunk head and flat countersunk head machine screws and machine screw and machine screw and tooth lock washer assemblies with recess drive systems. Cross recess data is shown in Appendix A. Lobed recess data is shown in Appendix D.

2. REFERENCES.

- ISO 261 - ISO General purpose metric screw threads - General plan.
- ISO 965 - ISO General purpose metric screw threads - Tolerance.
- ISO 1502 - ISO General purpose metric screw threads - Gauging.
- ISO 4762 - Hexagon socket head cap screws - Product grade A.
- ISO 7721 - Countersunk head screws - Head configuration and gauging.
- WA 900 - Dimensional requirements for hexagon and flanged hexagon bolts and screws, and hexagon screw and washer assemblies.
- WA 990 - Surface discontinuities of bolts and screws.

3. GENERAL REQUIREMENTS.

3.1 DIMENSIONS AND TOLERANCES. The dimensions and tolerances of pan head, raised countersunk head and flat countersunk head machine screws, and machine screw and tooth lock washer assemblies shall be in accordance with Clauses 1 - 8, Tables 1 - 4 and Figures 1 - 4.

3.2 WASHERS. The dimensions, tolerances and materials requirements of the washer component of machine screw and tooth lock washer assemblies shall be in accordance with WF 900.

The washer shall be free to rotate while disassembly from the screw is prevented.

3.3 RECESSES. The dimensions and tolerances of recesses in pan head, raised countersunk head and flat countersunk head machine screws, and machine screw and tooth lock washer assemblies shall be in accordance with the requirements in Appendix A.

3.4 PILOT POINTS. The dimensions, tolerances and form and position tolerances of pilot points shall be as specified in WA 900.

3.5 GAUGING.

3.5.1 COUNTERSUNK HEADS. For referee purposes the dimensions k and d_k are satisfied if the heads of countersunk screws meet the gauging requirements specified in Appendix B.

3.5.2 SCREW RING GAUGE. The screw ring gauge used in the determination of length of thread shall conform to the dimensions and tolerances defined in ISO 1502 appropriate to the specified thread and class of fit. The full thread shall commence immediately at the gauge face.

3.5.3 PENETRATION GAUGING. The method of penetration gauging, the gauge and the gauge point are defined in Appendix A.

3.6 PROTECTIVE FINISH. All dimensions and tolerances defined in this specification apply prior to the application of the protective finish except where otherwise specified.



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4. LENGTH.

- 4.1 **NORMAL LENGTH.** The normal length of a machine screw or a machine screw and tooth lock washer assembly is the distance from the bearing face or, in the case of countersunk screws, the theoretical junction of the countersunk face and the top of the head, to the furthest end of the threaded portion including any chamfer or radius but excluding a special feature such as a dog point. The nominal length of a machine screw or machine screw and tooth lock washer assembly having a special feature such as a dog point, is the junction of the countersunk face and the top of the head, to the commencement of the special feature.
- 4.2 **TOLERANCE OF LENGTH.** The length of machine screws and machine screw and tooth lock washer assemblies shall be within the tolerance on nominal length specified in the table below.

Dimensions in mm		
	Nominal length – L	Tolerance
	Up to and including 6	+/- 0.24
Over	6 up to and including 10	+/- 0.29
Over	10 up to and including 18	+/- 0.35
Over	18 up to and including 30	+/- 0.42
Over	30 up to and including 50	+/- 0.50
Over	50 up to and including 80	+/- 0.60
Over	80 up to and including 120	+/- 0.70
Over	120 up to and including 180	+/- 0.80
Over	180 up to and including 250	+/- 0.93

5. LENGTH OF THREAD AND THREAD RUN-OUT (REFEREE METHOD).

- 5.1 **THREAD.** In cases of dispute the thread length b shall be measured as the distance from the end of the screw to the leading face of a screw ring gauge (See Clause 3.5.2) which has been screwed as far as possible onto the screw by hand.
- 5.2 **RUN-OUT.** In cases of dispute dimensions a and x shall be measured using the ring gauge specified in Clause 3.5.2 screwed as far as possible onto the screw by hand.

6. DIAMETER OF SHANK (UNTHREADED PORTION).

- 6.1 **SCREWS.** The diameter of the unthreaded portion may be approximately equal to the pitch diameter (i.e., the normal thread rolling diameter) appropriate to the size of the thread or, alternatively, equal to the major diameter as specified in ISO 965.
- 6.2 **SCREW AND TOOTH LOCK WASHER ASSEMBLIES.** The diameter of the unthreaded portion of screw and tooth lock washer assemblies shall be less than the major diameter of the screw thread by an amount sufficient to allow free rotation of the washer.



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7. SCREW THREADS.

- 7.1 Prior to any surface treatment screw threads must conform to the dimensions and tolerances specified in ISO 261 and ISO 965 tolerance class 6g.
- 7.2 After electro or mechanical plating (when specified) screw threads may exceed the maximum dimensions for 6g, unless otherwise specified on the part drawing, but must not exceed the maximum dimensions for tolerance class 4h.

8. FORM AND POSITION TOLERANCES.

- 8.1 CONCENTRICITY OF SHANK TO THREAD. The concentricity of the shank (measured over dimension A - See Figure 4 and Clause 8.7) shall be within the values specified in Table 4.
 - 8.2 CONCENTRICITY OF PAN HEAD TO SHANK OR THREAD. The concentricity of the recess to the shank or thread (measured over dimension A - See Figure 4 and Clause 8.7) shall be within the values specified in Table 4.
 - 8.3 CONCENTRICITY OF RECESS TO SHANK OR THREAD. The concentricity of the recess to the shank or thread (measured over dimension A - See Figure 4 and Clause 8.7) shall be within the values specified in Table 4.
 - 8.4 RUN-OUT OF COUNTERSUNK FACE TO SHANK OR THREAD. The run-out of the countersunk face of flat countersunk and raised countersunk heads to the shank or thread (measured over dimension A - See Figure 4 and Clause 8.7) shall be within the values specified in Table 4.
 - 8.5 STRAIGHTNESS. The straightness (measured over dimension L - See Figure 4.) shall be within the values specified in Table 4.
 - 8.6 SQUARENESS OF THE BEARING SURFACE OF PAN HEADS TO THE SHANK OR THREAD. The bearing surface (measured over a diameter of $0.8d_k$) shall be square to the shank or thread (measured over dimension A - See Figure 4 and Clause 8.7) within 1° .
 - 8.7 FORM AND POSITION TOLERANCES - METHOD OF MEASUREMENT. When the datum feature is the threaded portion, the datum diameter shall be the Pitch Diameter. Alternatively a GO Screw Ring Gauge to ISO 1502, tolerance class 6h with a 05d minimum thickness may be used.
 - 8.8 POSITION TOLERANCES FOR PILOT POINTS SHALL BE AS SPECIFIED IN WA 900 TABLE 10 AND FIGURE 10.
9. SURFACE ROUGHNESS. The surface roughness of the bearing face shall be evaluated in line with WA 990 Clause 2.5.