



Torque Settings for Use in Assembly of Oracle Products

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Overview

This document is intended to indicate the torque settings that should be used during the manufacturing assembly process of Oracle products. The torque values in this document require there is a minimum of three full threads of engagement

Audience

External and Internal Manufacturing

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1. PRODUCT CHANGE NOTICE

Oracle requires that all processes, material or equipment changes that affect end product specifications must be approved in writing by Oracle applicable Purchasing Agent or Engineering, before changes can be incorporated into an Oracle product.

2. WAIVERS AND CHANGES

Waivers (deviations) related to the acceptance of this specification must be documented. No verbal waivers will be honored by Oracle. Changes made or agreed to by Oracle to the applicable purchase order require documented authorization from Oracle.

3. TORQUE SETTINGS

The following settings must be used during assembly of the systems. These settings apply to zinc coated hardware. For hardware with alternative coating, please see section 3.0. For any screws which are not identified in this document, please find torque specifications on the 2D assembly prints.

4. ANSI Fasteners

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
2-56 UNC	0.32	0.04	2.80	0.60
4-40 UNC	0.66	0.08	5.85	0.65
6-32 UNC	1.20	0.14	10.80	1.20
8-32 UNC	2.50	0.50	19.90	2.20
8-36 UNF	2.61	0.52	20.70	2.30
10-24 UNC	3.65	0.73	28.70	3.20
10-32 UNF	4.13	0.83	32.85	3.65
12-24 UNC	5.64	1.13	44.90	5.00
12-28 UNF	6.07	1.21	48.40	5.40
12-32 UNEF	6.30	1.26	50.15	5.55
¼-20 UNC	8.64	1.73	68.75	7.65

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
¼-28 UNF	9.98	2.00	78.65	8.75
¼-32 UNEF	10.29	2.06	81.90	9.10
5/16-18 UNC	17.86	3.57	141.00	11.90
5/16-20 UN	18.62	3.72	147.95	16.45
5/16-24 UNF	19.78	3.96	157.25	17.45
5/16-28 UN	20.54	4.11	164.15	18.25
5/16-32 UNEF	21.31	4.26	169.40	18.80

5. METRIC Fasteners

5.1 STEEL MACHINE SCREW FOR USE WITH SHEET METAL NUT AND PEMS (NON-LOCKING)

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
M2-M2.5	0.3	0.1	3	0.8
M3	0.8	0.17	7	1.5
M4	1.7	0.4	15	3.5
M5	2.3	0.8	20	7

5.2 THREAD ROLLING IN SHEET METAL AND EXTRUDED HOLE

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>HOLE SIZE</i>
M2.5	0.3	0.1	3	0.8
M3	0.8	0.17	7	2.7
M4	1.7	0.4	15	3.7
M5	2.3	0.8	20	4.6

5.3 PLASTITE SCREWS (FOR EQUIVLENT) FOR USE IN PLASTICS BOSS

Page 3 of 7 The following settings must be used during assembly of the systems. These settings apply to zinc coated hardware. For hardware with alternative coating, please see section 3.0. For any screws which are not identified in this document, please find torque /

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(BOSS DEPTH MINIMUM OF 5mm, PC-ABS, NO FILLERS)

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>	<i>Hole Dia.</i>
M3	0.3	0.05	3	0.5	2.4
M4	0.8	0.17	7	1.5	3.2
M5	1.7	0.4	15	3.5	4

5.4 STEEL SCREW THROUGH A PCB INTO SHEET METAL MOUNTED PEM

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
M3	0.8	0.17	7	1.5
M4	0.8	0.17	7	1.5

5.5 STEEL SCREW THROUGH AN EXTRUDED AND TAPPED HOLE

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
M2	0.39	0.06	3.47	0.5
M3	0.59	0.2	5.2	1.8
M3.5	0.98	0.32	8.67	2.8
M4	1.57	0.46	13.88	4.1
M5	2.94	0.94	26.02	8.3
M6	4.9	1.6	43.37	14.1

If the fastener is not listed in the above tables, please use the following table:

5.6 GENERIC

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
M1.6x0.35	0.13	0.03	1.10	0.20
M2x0.4	0.28	0.06	2.40	0.50

<i>SIZE mm</i>	<i>Nm</i>	<i>Nm Tolerance</i>	<i>Inlbs</i>	<i>Inlbs Tolerance</i>
M2.5x.45	0.56	0.11	4.90	1.00
M3x0.5	1.00	0.20	8.80	1.80
M3.5x0.6	1.57	0.32	13.90	2.80
M4x0.7	2.32	0.46	20.50	4.10
M5x0.8	4.70	0.94	41.60	8.30
M6x1	7.98	1.60	70.70	14.10
M6.3x1	9.42	1.88	83.40	16.70
M8x1.25	19.39	3.88	171.60	34.30
M10x1.5	38.40	7.68	339.80	68.00

6. CALCULATING TORQUE VALUES NOT LISTED IN TABLES ABOVE

The minimum rated tensile strength of the low-carbon steel screws we use is 60,000 psi. The maximum torque values in this engineering specification were calculated based on achieving a tensile stress that was 80% (48,000 psi) of the minimum rated tensile strength of standard slotted and recessed head machine screws. The minimum values are 20% less than the maximum torque values, to allow for joint relaxation and variances in air driver accuracy.

A screw's torque value is acceptable if it lies anywhere between the minimum and maximum values listed in this Engineering Torque Specification.

Torque values for screws needing to be added to the specification are to be calculated using the same criteria used in the above tables.

To calculate the proper torque for screws to be added to this specification, use the following formula:

$$T = KDAS \text{ where,}$$

$$T = \text{Maximum Screw Torque (lbf-in)}$$

K=Torque-Friction Coefficient. Use 0.2 (no units) unless a better value can be accurately calculated.

D=Fastener Nominal Diameter (inches). Use values listed in any fastener reference such as the ISO Fastener Standards.

A=Fastener Stress Area (sq. inches). Use values listed in any fastener reference.

S=Desired Fastener Tension (48,000 psi). For this engineering specification, the value used is 80% of the minimum tensile strength of low-carbon steel machine screws. The minimum tensile strength is 60,000 psi, therefore, the value of S used in the tables is 48,000 psi. This value can change if screws or bolts made of different materials (and tensile strengths) are used.

Example: 6-32 machine screw

$$\begin{aligned} T &= (.2) * (0.138 \text{ in}) * (0.00909 \text{ sq.in.}) * (48,000 \text{ lbf/sq.in.}) \\ &= 12.0 \text{ lbf-in (in/lbs)} \end{aligned}$$

The minimum torque value would be 80% of the calculated Maximum Torque (T).

Any values which differ from the above values must be listed and justified.

Metric values are calculated in the same manner, using necessary conversion factors.

7. TORQUE SETTING FOR SCREWS WITH ALTERNATIVE PLATING:

TBD

8. TORQUE SETTING FOR NYLOC FASTENER:

TBD

9. TORQUE SETTING FOR NUTS:

TBD

10. TORQUE DRIVER REQUIREMENTS

Driver speed: Slow starting, 200-400 RPM

Maximum driver speed: 1000 RPM

Document History and Approvals

Agile History			
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