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## Westfield Fasteners Product Specification:

### ASME B18.2.1 / ASME B18.6.3 - UNC Hex Head Set Screw

This product guide contains the specification for UNC threaded hex set screws, a series of standard parts available from Westfield Fasteners. The basis of this specification are the ASME standards ASME B18.2.1 and ASME B18.6.3.

#### Product Description

UNC hex head set screws are a fully threaded version of a hex bolt and are amongst the most common threaded fastener types. These hex head set screws are designed to be tightened with a standard spanner or ratchet and socket. These standard hex set screws are used in conjunction with UNC threaded nuts, and are used in a vast array of assemblies across the world. The external hexagonal drive allows for a greater torque load to be applied to the joint over most other drive types.

#### Scope of the ASME Standards

Unlike ISO standards, ASME standards usually cover a range or family of product types. ASME B18.2.1 covers many bolt types, including these UNC threaded hex set screws. The ASME B18.2.1 standard describes the dimensions and tolerances of hex head set screws with diameters beginning at 1/4 inch up to and including 4 inches. Hex head set screws with diameter sizes of 12 gauge and below are specified in ASME B18.6.3.

Tables 1 and 2 below define the dimensions and tolerances of these hex head screws to their respective standards.

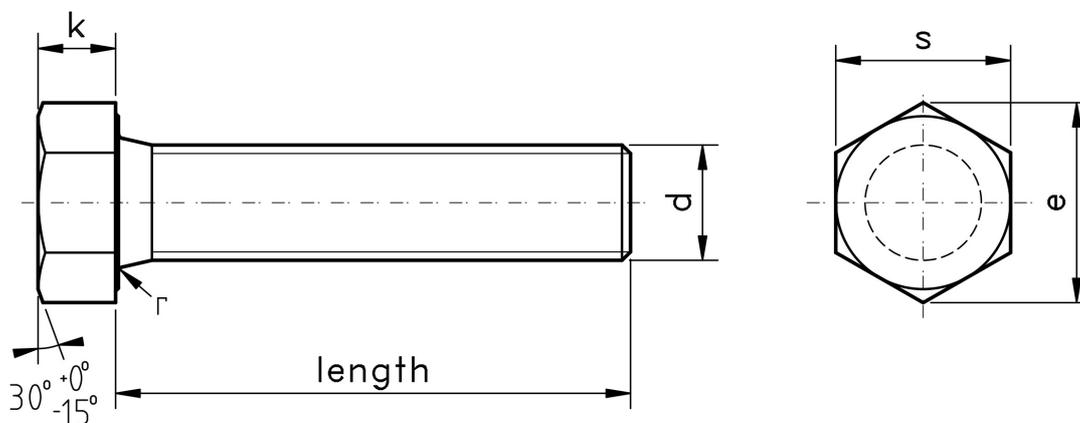


Figure 1: UNC Hex Head Set Screw

## Material and Strength Specifications

### ASME B18.6.3 - Diameters under 1/4"

Plain and zinc plated hex set screws are typically a non heat treated low carbon steel.

Stainless steel variants are typically produced to ASTM F837.

### ASME B18.2.1 - Diameters 1/4" to 1-1/2"

Grade 5 plain and zinc plated carbon steel variants of these hex set screws are typically produced to SAE J429. This means that the minimum tensile strength is 120 ksi for diameters 1/4 to 1 inch and a minimum of 105 ksi for 1 inch to 1-1/2 inch.

Stainless steel items are typically produced to ASTM F593, with the tensile strength beginning at 65 ksi, depending on condition.

For brass, the manufacturer decides on the chemical and mechanical properties.

Table 1: Dimensions & Tolerances according to ASME B18.6.3 (inch)

ASME B18.6.3 - UNC Hex Machine Screws												
Nominal Diameter		tpi	Body Diameter, E		Width Across Flats, A/F			Across Corners, W/G		Head Height, H		
			max	min	Basic	max	min	min	max	Basic	max	min
1	0.0730	64	-	-	-	0.125	0.120	0.134	-	-	0.044	0.036
2	0.0860	56	-	-	-	0.125	0.120	0.134	-	-	0.050	0.040
3	0.0990	48	-	-	-	0.188	0.181	0.202	-	-	0.055	0.044
4	0.1120	40	-	-	-	0.188	0.81	0.202	-	-	0.060	0.049
5	0.1250	40	-	-	-	0.188	0.181	0.202	-	-	0.070	0.058
6	0.1380	32	-	-	-	0.250	0.244	0.272	-	-	0.093	0.080
8	0.1640	32	-	-	-	0.250	0.244	0.272	-	-	0.110	0.096
10	0.1900	24	-	-	-	0.312	0.305	0.340	-	-	0.120	0.102
12	0.2160	24	-	-	-	0.312	0.305	0.340	-	-	0.155	0.139

Table 2: Dimensions & tolerances according to ASME B18.2.1 (inch)

ASME B18.2.1 - UNC Hex Set Screws															
Nominal Size or Basic Product Diameter	tpi	Full-Size body Diameter, d		Width Across Flats, s			Width Across Corners, e		Head Height, k			Radius of Fillet, r		Nominal Thread Length for Bolt Lengths, Lt	
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	6 in. and Shorter	Over 6 in.
1/4 (0.2500)	20	0.260	0.237	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150	0.03	0.01	0.750	1.000
5/16 (0.3125)	18	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	0.03	0.01	0.875	1.125
3/8 (0.3750)	16	0.388	0.360	9/16	0.562	0.544	0.650	0.6200	1/4	0.268	0.226	0.03	0.01	1.000	1.250
7/16 (0.4375)	14	0.452	0.421	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272	0.03	0.01	1.125	1.375
1/2 (0.5000)	13	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	0.03	0.01	1.250	1.500
5/8 (0.6250)	11	0.642	0.605	5/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	0.06	0.02	1.500	1.750
3/4 (0.7500)	10	0.768	0.729	1 1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	0.06	0.02	1.750	2.000
7/8 (0.8750)	9	0.895	0.895	1 5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	0.06	0.02	2.000	2.250
1 (1.0000)	8	1.022	1.022	1 1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591	0.09	0.03	2.250	2.500
1 1/8 (1.1250)	7	1.149	1.149	1 11/16	1.688	1.631	1.949	1.859	3/4	0.780	0.658	0.09	0.03	2.500	2.750
1 1/4 (1.2500)	7	1.277	1.277	1 7/8	1.875	1.812	2.165	2.066	27/32	0.876	0.749	0.09	0.03	2.750	3.000
1 3/8 (1.3750)	6	1.404	1.404	2 1/16	2.062	1.994	2.382	2.273	29/32	0.940	0.810	0.09	0.03	3.000	3.250
1 1/2 (1.5000)	6	1.531	1.531	2 1/4	2.250	2.175	2.598	2.480	1	1.036	0.902	0.09	0.03	3.250	3.500
1 5/8 (1.6250)	5-1/2	1.658	1.658	2 7/16	2.438	2.356	2.815	2.616	1 3/32	1.116	0.978	0.09	0.03	3.500	3.750
1 3/4 (1.7500)	5	1.785	1.785	2 5/8	2.625	2.538	3.031	2.893	1 5/32	1.196	1.054	0.12	0.04	3.750	4.000
1 7/8 (1.8750)	4-1/2	1.912	1.912	2 13/16	2.812	2.719	3.248	3.099	1 1/4	1.276	1.130	0.12	0.04	4.000	4.250

Table 2: Dimensions & tolerances according to ASME B18.2.1 (inch) Continued

ASME B18.2.1 - UNC Hex Set Screws															
Nominal Size or Basic Product Diameter	tpi	Full-Size body Diameter, d		Width Across Flats, s			Width Across Corners, e		Head Height, k			Radius of Fillet, r		Nominal Thread Length for Bolt Lengths, Lt	
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	6 in. and Shorter	Over 6 in.
2 (2.0000)	4-1/2	2.039	2.039	3	3.000	2.900	3.464	3.306	1 <sub>11/32</sub>	1.388	1.175	0.12	0.04	4.250	4.500
2 <sub>1/4</sub> (2.2500)	4-1/2	2.305	2.305	3 <sub>3/8</sub>	3.375	3.262	3.897	3.719	1 <sub>1/2</sub>	1.548	1.327	0.19	0.06	4.750	5.000
2 <sub>1/2</sub> (2.5000)	4	2.559	2.559	3 <sub>3/4</sub>	3.750	3.625	4.330	4.133	1 <sub>21/32</sub>	1.708	1.479	0.19	0.06	5.250	5.500
2 <sub>3/4</sub> (2.7500)	4	2.827	2.827	4 <sub>1/8</sub>	4.125	3.988	4.763	4.546	1 <sub>13/16</sub>	1.869	1.632	0.19	0.06	5.750	6.000
3 (3.0000)	4	3.081	3.081	4 <sub>1/2</sub>	4.500	4.350	5.196	4.959	2	2.060	1.815	0.19	0.06	6.250	6.500
3 <sub>1/4</sub> (3.2500)	4	3.335	3.335	4 <sub>7/8</sub>	4.875	4.712	5.629	5.372	2 <sub>3/16</sub>	2.251	1.936	0.19	0.06	6.750	7.000
3 <sub>1/2</sub> (3.5000)	4	3.589	3.589	5 <sub>1/4</sub>	5.250	5.075	6.062	5.786	2 <sub>5/16</sub>	2.380	2.057	0.19	0.06	7.250	7.500
3 <sub>3/4</sub> (3.7500)	4	3.858	3.858	5 <sub>5/8</sub>	5.625	5.437	6.495	6.198	2 <sub>1/2</sub>	2.572	2.241	0.19	0.06	7.750	8.000
4 (4.0000)	4	4.111	4.111	6	6.000	5.800	6.928	6.612	2 <sub>11/16</sub>	2.764	2.424	0.19	0.06	8.250	8.500

For further details, please refer to the ASME standard document for this item.

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