



Metric Hexagon Bolts with Heavy Flange and M-Point, Product Grade A

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

Note: Bolt Body Shank diameter on M5, M6, M8, M10, M12, M14, M16, M18 and M20 shall be of Reduced or Full Body Shank. Reduced shank diameter is preferred for mass savings.

Note: Radius Corner Head also referred to as Acorn Head.

1.1 Purpose. This standard specifies the design characteristics of hexagon bolts with heavy flange and M-Point (see GMW3362).

1.2 Applicability. Design Criteria for the development of Metric Hexagon Bolts with Heavy Flange and M-Point, Product Grade A.

1.3 Remarks. This standard is based on European standard EN 1665 and ASME B18.2.3.9M.

- See Tables 5 thru 7 for Standard Length Dimensions of Metric Hexagon Bolt with Heavy Flange and M-Point
- See Figure 7 for Under Head Length dimensional representation of Bolts Fully Threaded to Head and Bolts of Full Body and Shoulder; references for Table 5
- See Figure 8 reference to Length Dimension Under Head Maximum, Bearing Face to first Full Thread on bolts fully threaded

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASME B18.2.3.9M	ISO 724	ISO 965-3	ISO 4759-1
EN 1665	ISO 965-1	ISO 1502	ISO 6157-3
ISO 225	ISO 965-2	ISO 3508	IATF 16949

2.2 GM Standards/Specifications.

GMW25	GMW3059	GMW3362	GMW16551
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3 Requirements

3.1 Metric Hexagon Bolt Heavy Flange and M-Point. See Figures 1 and 2.

Figure 1: Metric Hexagon Bolt with Heavy Flange and M-Point (Full Body)

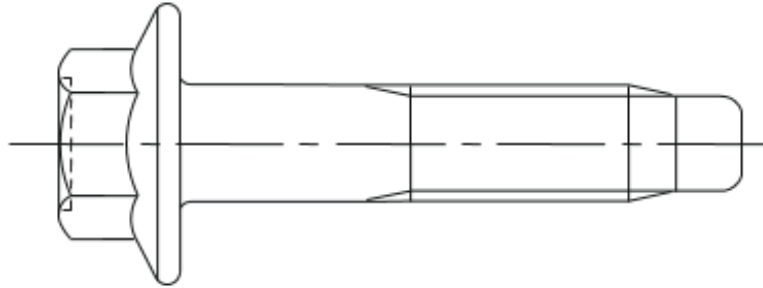
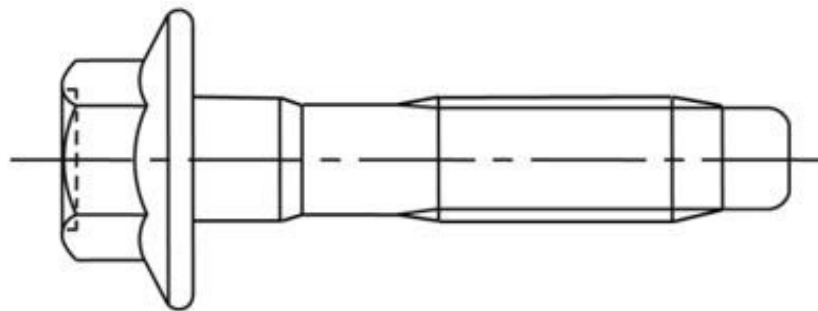
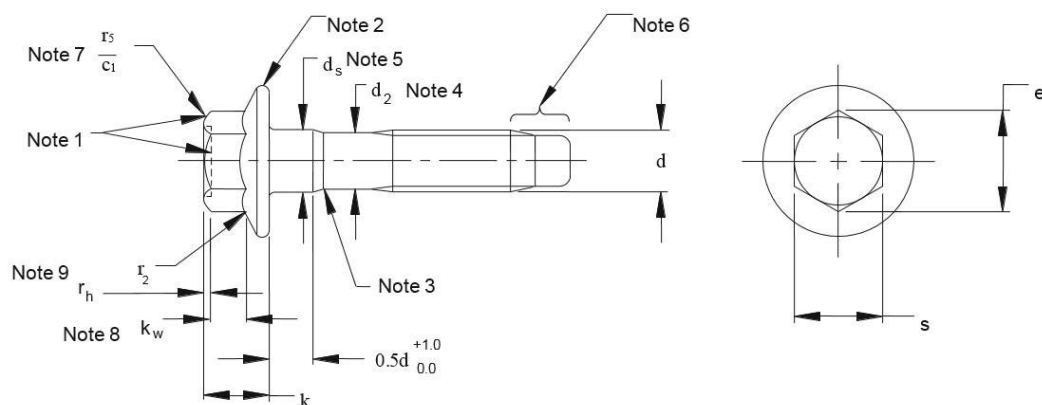


Figure 2: Metric Hexagon Bolt with Heavy Flange and M-Point (Reduced Body)



3.2 Dimensions. See Figure 3.

Figure 3: Dimensions of Metric Hexagon Bolts with Heavy Flange and M-Point



Note 1: The top of the head shall be either full form or indented. If fastener specific detail does not specifically state indentation criteria, indentation will be at the manufacturer's option. Head transition shall be either chamfered or rounded with the minimum diameter of the head transition circle at the maximum width across flats minus 15%. If the top of the head is indented, on diameters > M12, the periphery may be rounded. See Note 7.

Note 2: Edge contour optional.

Note 3: Rounded or chamfered or conical (Reduced Shank).

Note 4: d_2 is approximately equal to the pitch diameter (thread rolling diameter) (Reduced Shank).

Note 5: Shank Diameter, see specific fillet detail.

Note 6: M-point GMW3362.

Note 7: r_5 = (M5, M6, M8 and M10) = Radius Corner, c_1 = ($\varnothing \geq M12$) = Chamfer Corner, unless indented head, then rounded periphery is acceptable. See Table 1.

Note 8: k_w based on ASME B18.2.3.9M.

Note 9: r_h = (M5, M6, M8 and M10) = Radius Corner Height.

Note: Symbolology per ISO 225.

Table 1: Dimensions of Metric Hexagon Bolts with Heavy Flange and M-Point

Thread	d	M5	M6	M8	M10	M12	M14	M16	M18	M20
Fillet Type (see following fillet detail)		F Note 1	F Note 1	F Note 1	F Note 1	F Note 1	F Note 1	F Note 1	F Note 1	F Note 1
		-	-	-	U Note 2	U Note 2	U Note 2	U Note 2	U Note 2	U Note 2
P	Pitch	0.8	1.0	1.25	1.5	1.75	2.0	2.0	2.5	2.5
e	max	9.24	11.55	15.01	17.32	20.78	24.25	27.71	31.18	34.64
	min	8.71	10.95	14.26	16.49	19.86	23.15	26.51	29.87	33.23
s	max	8.00	10.00	13.00	15.00	18.00	21.00	24.00	27.00	30.00
	min	7.78	9.78	12.73	14.73	17.73	20.67	23.67	26.67	29.67
k	max	5.8	6.6	8.1	10.4	11.8	13.7	15.4	17.2	18.9
k_w	min	2.4	2.7	3.6	4.6	5.2	6.3	7.1	7.9	8.8
r_2	max	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.2	1.2
r_5	min	1.25	1.5	2.0	2.5	-	-	-	-	-
r_h	min	0.8	1.0	1.5	2.0	-	-	-	-	-
C_1	-	-	-	-	-	15° to 30°	15° to 30°	15° to 30°	15° to 30°	15° to 30°

Note 1: See Table 3 and Figure 5 for Type F Dimensions for Fillet type on bolts Fully Threaded to Head. See Table 4 and Figure 6 for Type F Dimensions for Fillet Type for Full Body or Shoulder bolts.

Note 2: See Table 2 and Figure 4 for Type U dimensions.

Note: All dimensions in millimeters (mm).

Note: max = maximum, min = minimum.

Table 2: Dimensions of Metric Hexagon Bolts with Heavy Flange and M-Point for Long Bolts Type U Fillet

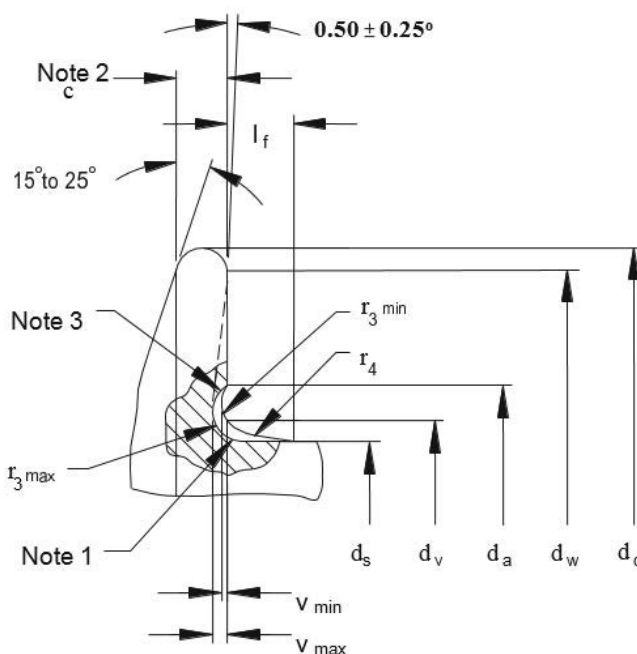
Thread	d	M10	M12	M14	M16	M18	M20
Fillet Type	-	U Note 1	U Note 1	U Note 1	U Note 1	U Note 1	U Note 1
P	Pitch	1.5	1.75	2.0	2.0	2.5	2.5
c	min	1.5	1.8	2.1	2.4	2.8	3.0
d _a	max	12.5	15.2	17.7	20.5	23.3	25.7
d _c	max	22.3	26.6	30.5	35.0	39.0	43.0
d _s	max	10	12	14	16	18	20
	min	9.78	11.73	13.73	15.73	17.73	19.67
d _v	max	10.8	12.8	14.8	17.2	19.4	21.6
d _w	min	19.6	23.8	27.6	31.9	35.9	39.9
l _f	max	2.1	2.1	2.1	3.2	3.7	4.2
r ₃	max	0.45	0.54	0.63	0.72	0.81	0.90
	min	0.20	0.24	0.28	0.32	0.36	0.40
r ₄	ref	5.7	5.7	5.7	8.8	10.1	11.5
v	max	0.30	0.35	0.45	0.50	0.60	0.65
	min	0.15	0.15	0.20	0.25	0.30	0.30

Note 1: See Figure 4 for Type U dimensions.

Note: All dimensions in millimeters (mm).

Note: ref = reference.

Figure 4: Dimensions of Metric Hexagon Bolts with Heavy Flange and M-Point for Long Bolts Type U Fillet



Note 1: Maximum and minimum under head fillet radius. Fillet shall lie within envelope.

Note 2: c is measured at d_w minimum.

Note 3: Junction of fillet with bearing surface to be a smooth blend.

Note: Symbolism per ISO 225.