UDC 621.882.211

October 1989

# Hexagon fit bolts for structural steel bolting for supply with or without nut

DIN 7968

Sechskant-Paßschrauben ohne Mutter oder mit Sechskantmutter für Stahlkonstruktionen

Supersedes January 1971 edition.

*In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.*

The new widths across flats 18 mm and 34 mm as specified in ISO 272 should be used instead of the previous widths across flats 19 mm and 32 mm for thread sizes M12 and M22. It is intended to omit the obsolescent widths across flats by 1 November 1994 at the latest.

Dimensions in mm

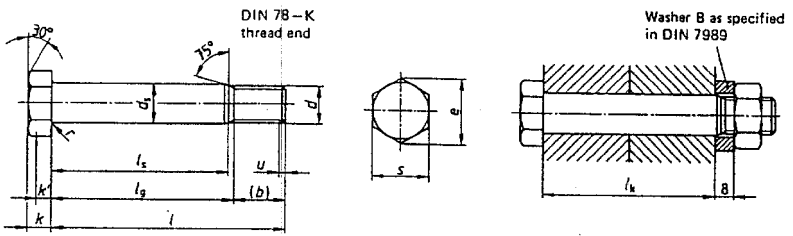
## 1 Scope and field of application

This standard specifies requirements for M12 to M30 hexagon fit bolts assigned to product grade C for use in structural steel bolting.

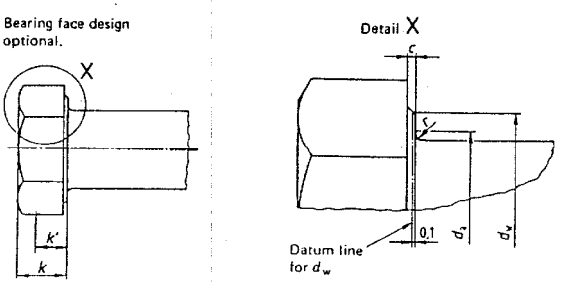
## 2 Dimensions

For supply without nut

For supply with DIN 555 or ISO 4034 hexagon nut




$u = 2P$ maximum; incomplete thread.




Continued on pages 2 to 6

Table.

| Thread size ($d$) | | | M12 | | M16 | | M20 | M22 | | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $P$ [1]) | | | 1,75 | | 2 | | 2,5 | 2,5 | | 3 | 3 | 3,5 |
| $b$ (auxiliary dimension) | | | 17,12 | | 20,5 | | 23,75 | 25,75 | | 26,5 | 29,5 | 31,25 |
| $c$ | max. | | 0,6 | | 0,8 | | 0,8 | 0,8 | | 0,8 | 0,8 | 0,8 |
| $d_a$ | max. | | 14,7 | | 18,7 | | 24,4 | 26,4 | | 28,4 | 32,4 | 35,4 |
| $d_s$ | h11 | | 13 | | 17 | | 21 | 23 | | 25 | 28 | 31 |
| $d_w$ | min. | | 16,4 | 17,2 | 22 | | 27,7 | 31,4 | 29,5 | 33,2 | 38 | 42,7 |
| $e$ | min. | | 19,85 | 20,88 | 26,17 | | 32,95 | 37,29 | 35,03 | 39,55 | 45,20 | 50,85 |
| $k$ | Nominal size | | 8 | | 10 | | 13 | 14 | | 15 | 17 | 19 |
| | min. | | 7,55 | | 9,25 | | 12,1 | 13,1 | | 14,1 | 16,1 | 17,95 |
| | max. | | 8,45 | | 10,75 | | 13,9 | 14,9 | | 15,9 | 17,9 | 20,05 |
| $k'$ | min. | | 5,28 | | 6,47 | | 8,47 | 9,17 | | 9,87 | 11,27 | 12,56 |
| $r$ | min. | | 0,6 | | 0,6 | | 0,8 | 0,8 | | 0,8 | 1 | 1 |
| $s$ | max. = nominal size | | 18 [2]) | 19 | 24 | | 30 | 34 [2]) | 32 | 36 | 41 | 46 |
| | min. | | 17,57 | 18,48 | 23,16 | | 29,16 | 33 | 31 | 35 | 40 | 45 |

| $l$ | | | Lengths $l_s$ *) and $l_g$ **) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal size | min. | max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. | $l_s$ min. | $l_g$ max. |
| 30 | 28,95 | 31,05 | 8,5 | 12,88 | | | | | | | | | | | | | | |
| 35 | 33,75 | 36,25 | 13,5 | 17,88 | 9,5 | 14,5 | | | | | | | | | | | | |
| 40 | 38,75 | 41,25 | 18,5 | 22,88 | 14,5 | 19,5 | 10 | 16,25 | | | | | | | | | | |
| 45 | 43,75 | 46,25 | 23,5 | 27,88 | 19,5 | 24,5 | 15 | 21,25 | 13 | 19,25 | | | | | | | | |
| 50 | 48,75 | 51,25 | 28,5 | 32,88 | 24,5 | 29,5 | 20 | 26,25 | 18 | 24,25 | 16 | 23,5 | | | | | | |
| 55 | 53,5 | 56,5 | 33,5 | 37,88 | 29,5 | 34,5 | 25 | 31,25 | 23 | 29,25 | 21 | 28,5 | | | | | | |
| 60 | 58,5 | 61,5 | 38,5 | 42,88 | 34,5 | 39,5 | 30 | 36,25 | 28 | 34,25 | 26 | 33,5 | 23 | 30,5 | | | | |
| 65 | 63,5 | 66,5 | 43,5 | 47,88 | 39,5 | 44,5 | 35 | 41,25 | 33 | 39,25 | 31 | 38,5 | 28 | 35,5 | | | | |
| 70 | 68,5 | 71,5 | 48,5 | 52,88 | 44,5 | 49,5 | 40 | 46,25 | 38 | 44,25 | 36 | 43,5 | 33 | 40,5 | 30 | 38,75 | | |
| 75 | 73,5 | 76,5 | 53,5 | 57,88 | 49,5 | 54,5 | 45 | 51,25 | 43 | 49,25 | 41 | 48,5 | 38 | 45,5 | 35 | 43,75 | | |
| 80 | 78,5 | 81,5 | 58,5 | 62,88 | 54,5 | 59,5 | 50 | 56,25 | 48 | 54,25 | 46 | 53,5 | 43 | 50,5 | 40 | 48,75 | | |
| 85 | 83,25 | 86,75 | 63,5 | 67,88 | 59,5 | 64,5 | 55 | 61,25 | 53 | 59,25 | 51 | 58,5 | 48 | 55,5 | 45 | 53,75 | | |
| 90 | 88,25 | 91,75 | 68,5 | 72,88 | 64,5 | 69,5 | 60 | 66,25 | 58 | 64,25 | 56 | 63,5 | 53 | 60,5 | 50 | 58,75 | | |
| 95 | 93,25 | 96,75 | 73,5 | 77,88 | 69,5 | 74,5 | 65 | 71,25 | 63 | 69,25 | 61 | 68,5 | 58 | 65,5 | 55 | 63,75 | | |
| 100 | 98,25 | 101,75 | 78,5 | 82,88 | 74,5 | 79,5 | 70 | 76,25 | 68 | 74,25 | 66 | 73,5 | 63 | 70,5 | 60 | 68,75 | | |
| 105 | 103,25 | 106,75 | 83,5 | 87,88 | 79,5 | 84,5 | 75 | 81,25 | 73 | 79,25 | 71 | 78,5 | 68 | 75,5 | 65 | 73,75 | | |
| 110 | 108,25 | 111,75 | 88,5 | 92,88 | 84,5 | 89,5 | 80 | 86,25 | 78 | 84,25 | 76 | 83,5 | 73 | 80,5 | 70 | 78,75 | | |
| 115 | 113,25 | 116,75 | 93,5 | 97,88 | 89,5 | 94,5 | 85 | 91,25 | 83 | 89,25 | 81 | 88,5 | 78 | 85,5 | 75 | 83,75 | | |
| 120 | 118,25 | 121,75 | 98,5 | 102,88 | 94,5 | 99,5 | 90 | 96,25 | 88 | 94,25 | 86 | 93,5 | 83 | 90,5 | 80 | 88,75 | | |
| 125 | 123 | 127 | | | 99,5 | 104,5 | 95 | 101,25 | 93 | 99,25 | 91 | 98,5 | 88 | 95,5 | 85 | 93,75 | | |
| 130 | 128 | 132 | | | 104,5 | 109,5 | 100 | 106,25 | 98 | 104,25 | 96 | 103,5 | 93 | 100,5 | 90 | 98,75 | | |
| 135 | 133 | 137 | | | 109,5 | 114,5 | 105 | 111,25 | 103 | 109,25 | 101 | 108,5 | 98 | 105,5 | 95 | 103,75 | | |
| 140 | 138 | 142 | | | 114,5 | 119,5 | 110 | 116,25 | 108 | 114,25 | 106 | 113,5 | 103 | 110,5 | 100 | 108,75 | | |
| 145 | 143 | 147 | | | 119,5 | 124,5 | 115 | 121,25 | 113 | 119,25 | 111 | 118,5 | 108 | 115,5 | 105 | 113,75 | | |
| 150 | 148 | 152 | | | 124,5 | 129,5 | 120 | 126,25 | 118 | 124,25 | 116 | 123,5 | 113 | 120,5 | 110 | 118,75 | | |
| 155 | 151 | 159 | | | 129,5 | 134,5 | 125 | 131,25 | 123 | 129,25 | 121 | 128,5 | 118 | 125,5 | 115 | 123,75 | | |
| 160 | 156 | 164 | | | 134,5 | 139,5 | 130 | 136,25 | 128 | 134,25 | 126 | 133,5 | 123 | 130,5 | 120 | 128,75 | | |
| 165 | 161 | 169 | | | | | 135 | 141,25 | 133 | 139,25 | 131 | 138,5 | 128 | 135,5 | 125 | 133,75 | | |
| 170 | 166 | 174 | | | | | 140 | 146,25 | 138 | 144,25 | 136 | 143,5 | 133 | 140,5 | 130 | 138,75 | | |
| 175 | 171 | 179 | | | | | 145 | 151,25 | 143 | 149,25 | 141 | 148,5 | 138 | 145,5 | 135 | 143,75 | | |
| 180 | 176 | 184 | | | | | 150 | 156,25 | 148 | 154,25 | 146 | 153,5 | 143 | 150,5 | 140 | 148,75 | | |
| 185 | 180,4 | 189,6 | | | | | | | 153 | 159,25 | 151 | 158,5 | 148 | 155,5 | 145 | 153,75 | | |
| 190 | 185,4 | 194,6 | | | | | | | 158 | 164,25 | 156 | 163,5 | 153 | 160,5 | 150 | 158,75 | | |
| 195 | 190,4 | 199,6 | | | | | | | 163 | 169,25 | 161 | 168,5 | 158 | 165,5 | 155 | 163,75 | | |
| 200 | 195,4 | 204,6 | | | | | | | 168 | 174,25 | 166 | 173,5 | 163 | 170,5 | 160 | 168,75 | | |

Commercial sizes of hexagon bolts are those for which lengths $l_s$ and $l_g$ have been specified.

*) $l_{s\,min} = l_{g\,max} - 2{,}5\,P$.

**) $l_{g\,max} = l_{nominal\,size} - b$.

1) $P$ = pitch of thread.

2) Where bolts with nuts are ordered, the nuts to be supplied shall comply with ISO 4034 (see foreword on page 1).

## 3 Technical delivery conditions

| Material | | Steel |
|---|---|---|
| General requirements | | As specified in DIN 267 Part 1. |
| Thread | Tolerance | 8 g |
| | As specified in | DIN 13 Parts 12 and 15. |
| Mechanical properties | Property class | 5.6 |
| | As specified in | ISO 898 Part 1. |
| Limit deviations and geometrical tolerances | Product grade | C |
| | As specified in | ISO 4759 Part 1. |
| Surface finish | | As processed.<br>DIN 267 Part 9 shall apply with regard to electroplating.<br>DIN 267 Part 10 shall apply with regard to hot dip galvanizing. |
| Acceptance inspection | | DIN 267 Part 5 shall apply with regard to acceptance inspection. |

## 4 Designation

Designation of an M 20 hexagon fit bolt of nominal length, $l$ = 100, for supply without nut, of property class 5.6:

Hexagon fit bolt DIN 7968 – M20 x 100 – 5.6

Designation of an M 20 hexagon fit bolt of nominal length, $l$ = 100, for supply with hexagon nut (Mu)[1], of property class 5.6:

Hexagon fit bolt DIN 7968 – M20 x 100 – Mu – 5.6

The designation signifies that the widths across flats for sizes M 12 and M 22 are those hitherto specified, i.e. 19 mm and 32 mm. If bolts are to be supplied with a new width across flats as specified in ISO 272 (18 mm or 34 mm), the width across flats (SW) shall be included in the designation, e.g.

Hexagon fit bolt DIN 7968 – M 12 x 80 – Mu – SW 18 – 5.6

The DIN 4000 – 2 – 2 tabular layout of article characteristics shall apply for bolts covered in this standard.

[1] Where the bolts are supplied in given quantities, the nuts may accompany the consignment in bulk packaging.

## 5 Mass

The values given should be regarded as guideline values. For sizes M12 and M22, they apply to bolts with the previously used widths across flats 19 mm and 32 mm.

| Thread size ($d$) | M12 | M16 | M20 | M22 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|
| Length, $l$ | Mass with nut (7,85 kg/dm³), in kg per 1000 units ≈ | | | | | | |
| 30 | 60,9 | | | | | | |
| 35 | 66,1 | 122 | | | | | |
| 40 | 71,3 | 131 | 232 | | | | |
| 45 | 76,5 | 140 | 246 | 304 | | | |
| 50 | 81,7 | 149 | 260 | 320 | 402 | | |
| 55 | 86,9 | 158 | 274 | 336 | 421 | | |
| 60 | 92,1 | 167 | 288 | 352 | 440 | 605 | |
| 65 | 97,3 | 176 | 302 | 368 | 459 | 629 | |
| 70 | 102 | 185 | 316 | 384 | 478 | 653 | 860 |
| 75 | 107 | 194 | 330 | 400 | 497 | 677 | 890 |
| 80 | 112 | 203 | 344 | 416 | 516 | 701 | 920 |
| 85 | 117 | 212 | 358 | 432 | 535 | 725 | 950 |
| 90 | 122 | 221 | 372 | 448 | 554 | 749 | 980 |
| 95 | 127 | 230 | 386 | 464 | 573 | 773 | 1010 |
| 100 | 132 | 239 | 400 | 480 | 592 | 797 | 1040 |
| 105 | 137 | 248 | 414 | 496 | 611 | 821 | 1070 |
| 110 | 142 | 257 | 428 | 512 | 630 | 845 | 1100 |
| 115 | 147 | 266 | 442 | 528 | 649 | 869 | 1130 |
| 120 | 152 | 275 | 456 | 544 | 668 | 893 | 1160 |
| 125 | | 284 | 470 | 560 | 687 | 917 | 1190 |
| 130 | | 293 | 484 | 576 | 706 | 941 | 1220 |
| 135 | | 302 | 498 | 592 | 725 | 965 | 1250 |
| 140 | | 311 | 512 | 608 | 744 | 989 | 1280 |
| 145 | | 320 | 526 | 624 | 763 | 1013 | 1310 |
| 150 | | 329 | 540 | 640 | 782 | 1037 | 1340 |
| 155 | | 338 | 554 | 656 | 801 | 1061 | 1370 |
| 160 | | 347 | 568 | 672 | 820 | 1085 | 1400 |
| 165 | | | 582 | 688 | 839 | 1109 | 1430 |
| 170 | | | 596 | 704 | 858 | 1133 | 1460 |
| 175 | | | 610 | 720 | 877 | 1157 | 1490 |
| 180 | | | 624 | 736 | 896 | 1181 | 1520 |
| 185 | | | | 752 | 915 | 1205 | 1550 |
| 190 | | | | 768 | 934 | 1229 | 1580 |
| 195 | | | | 784 | 953 | 1253 | 1610 |
| 200 | | | | 800 | 972 | 1277 | 1640 |
| Mass of nuts, in kg per 1000 units, ≈ | 15,9 | 30,8 | 60,3 | 80,2 | 103 | 154 | 216 |

## 6 Grip lengths

| Thread size ($d$) | M12 | M16 | M20 | M22 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|
| Length, $l$ | Grip length, $l_k$ | | | | | | |
| 30 | 5 to 9 | | | | | | |
| 35 | 10 to 14 | 6 to 10 | | | | | |
| 40 | 15 to 19 | 11 to 15 | 8 to 12 | | | | |
| 45 | 20 to 24 | 16 to 20 | 13 to 17 | 11 to 15 | | | |
| 50 | 25 to 29 | 21 to 25 | 18 to 22 | 16 to 20 | 14 to 18 | | |
| 55 | 30 to 34 | 26 to 30 | 23 to 27 | 21 to 25 | 19 to 23 | | |
| 60 | 35 to 39 | 31 to 35 | 28 to 32 | 26 to 30 | 24 to 28 | 21 to 25 | |
| 65 | 40 to 44 | 36 to 40 | 33 to 37 | 31 to 35 | 29 to 33 | 26 to 30 | |
| 70 | 45 to 49 | 41 to 45 | 38 to 42 | 36 to 40 | 34 to 38 | 31 to 35 | 29 to 33 |
| 75 | 50 to 54 | 46 to 50 | 43 to 47 | 41 to 45 | 39 to 43 | 36 to 40 | 34 to 38 |
| 80 | 55 to 59 | 51 to 55 | 48 to 52 | 46 to 50 | 44 to 48 | 41 to 45 | 39 to 43 |
| 85 | 60 to 64 | 56 to 60 | 53 to 57 | 51 to 55 | 49 to 53 | 46 to 50 | 44 to 48 |
| 90 | 65 to 69 | 61 to 65 | 58 to 62 | 56 to 60 | 54 to 58 | 51 to 55 | 49 to 53 |
| 95 | 70 to 74 | 66 to 70 | 63 to 67 | 61 to 65 | 59 to 63 | 56 to 60 | 54 to 58 |
| 100 | 75 to 79 | 71 to 75 | 68 to 72 | 66 to 70 | 64 to 68 | 61 to 65 | 59 to 63 |
| 105 | 80 to 84 | 76 to 80 | 73 to 77 | 71 to 75 | 69 to 73 | 66 to 70 | 64 to 68 |
| 110 | 85 to 89 | 81 to 85 | 78 to 82 | 76 to 80 | 74 to 78 | 71 to 75 | 69 to 73 |
| 115 | 90 to 94 | 86 to 90 | 83 to 87 | 81 to 85 | 79 to 83 | 76 to 80 | 74 to 78 |
| 120 | 95 to 99 | 91 to 95 | 88 to 92 | 86 to 90 | 84 to 88 | 81 to 85 | 79 to 83 |
| 125 | | 96 to 100 | 93 to 97 | 91 to 95 | 89 to 93 | 86 to 90 | 84 to 88 |
| 130 | | 101 to 105 | 98 to 102 | 96 to 100 | 94 to 98 | 91 to 95 | 89 to 93 |
| 135 | | 106 to 110 | 103 to 107 | 101 to 105 | 99 to 103 | 96 to 100 | 94 to 98 |
| 140 | | 111 to 115 | 108 to 112 | 106 to 110 | 104 to 108 | 101 to 105 | 99 to 103 |
| 145 | | 116 to 120 | 113 to 117 | 111 to 115 | 109 to 113 | 106 to 110 | 104 to 108 |
| 150 | | 121 to 125 | 118 to 122 | 116 to 120 | 114 to 118 | 111 to 115 | 109 to 113 |
| 155 | | 126 to 130 | 123 to 127 | 121 to 125 | 119 to 123 | 116 to 120 | 114 to 118 |
| 160 | | 131 to 135 | 128 to 132 | 126 to 130 | 124 to 128 | 121 to 125 | 119 to 123 |
| 165 | | | 133 to 137 | 131 to 135 | 129 to 133 | 126 to 130 | 124 to 128 |
| 170 | | | 138 to 142 | 136 to 140 | 134 to 138 | 131 to 135 | 129 to 133 |
| 175 | | | 143 to 147 | 141 to 145 | 139 to 143 | 136 to 140 | 134 to 138 |
| 180 | | | 148 to 152 | 146 to 150 | 144 to 148 | 141 to 145 | 139 to 143 |
| 185 | | | | 151 to 155 | 149 to 153 | 146 to 150 | 144 to 148 |
| 190 | | | | 156 to 160 | 154 to 158 | 151 to 155 | 149 to 153 |
| 195 | | | | 161 to 165 | 159 to 163 | 156 to 160 | 154 to 158 |
| 200 | | | | 166 to 170 | 164 to 168 | 161 to 165 | 159 to 163 |

## Standards referred to

| | | |
|---|---|---|
| DIN | 13 Part 12 | ISO metric screw threads; coarse and fine pitch threads from 1 to 300 mm diameter; selection of diameters and pitches |
| DIN | 13 Part 15 | ISO metric screw threads; fundamental deviations and tolerances for screw threads of 1 mm diameter and larger |
| DIN | 78 | Thread ends and lengths of projection of bolt ends for ISO metric threads as specified in DIN 13 |
| DIN | 267 Part 1 | Fasteners; technical delivery conditions; general requirements |
| DIN | 267 Part 5 | Fasteners; technical delivery conditions; acceptance inspection (modified version of ISO 3269, 1984 edition) |
| DIN | 267 Part 9 | Fasteners; technical delivery conditions; electroplated components |
| DIN | 267 Part 10 | Fasteners; technical delivery conditions; hot dip galvanized components |
| DIN | 555 | M 5 to M 100 X 6 hexagon nuts; product grade C |
| DIN | 4000 Part 2 | Tabular layout of article characteristics for bolts, screws and nuts |
| DIN | 7989 | Washers for structural steel bolting |
| ISO | 272 | Fasteners; hexagon products; widths across flats |
| ISO | 898 Part 1 | Mechanical properties of fasteners; bolts, screws and studs |
| ISO | 4034 | Hexagon nuts; product grade C |
| ISO | 4759 Part 1 | Tolerances for fasteners; bolts, screws and nuts with thread diameters $\geq 1{,}6$ and $\leq 150$ mm and product grades A, B and C |

## Previous editions

DIN 7968: 07.55, 10.56, 03.63, 01.71.

## Amendments

The following amendments have been made to the January 1971 edition.

a) Widths across flats 18 mm and 34 mm as specified in ISO 272 have been adopted additionally for thread sizes M 12 and M 22.

b) A note on the use of obsolescent widths across flats has been included.

c) The scope of the standard has been extended to include hexagon nuts as specified in ISO 4034.

d) Nut height $m$ is no longer specified.

e) Specifications for the bearing face design have been included.

f) Limits of size are now specified.

g) Lengths $l_s$ and $l_g$ are now specified.

h) Bolts are now to be hot dip galvanized as specified in DIN 267 Part 10.

i) The standard has been editorially revised.

## International Patent Classification

E 04 B 1/38
F 16 B 35/00
F 16 B 37/00
F 16 B 5/02
F 16 B 23/00