

# INTERNATIONAL STANDARD

ISO  
4016

Second edition  
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ORGANISATION INTERNATIONALE DE NORMALISATION  
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

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## Hexagon head bolts — Product grade C

*Boulons à tête hexagonale — Grade C*

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Reference number  
ISO 4016: 1988 (E)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4016 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

This second edition cancels and replaces the first edition (ISO 4016 : 1979), to which the following major alterations have been made:

- a) the range of threads has been extended to be M5 to M64;
- b) the range of nominal lengths has been extended up to 500 mm;
- c) non-preferred threads have been entered;
- d) in addition to the property classes 4.6 and 4.8, property class 3.6 has been entered.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

# Hexagon head bolts — Product grade C

## 0 Introduction

This International Standard is part of the complete ISO product standard series on hexagon drive fasteners. The series comprises :

- a) hexagon head bolts (ISO 4014, ISO 4015, ISO 4016 and ISO 8765) ;
- b) hexagon head screws (ISO 4017, ISO 4018 and ISO 8676) ;
- c) hexagon nuts (ISO 4032, ISO 4033, ISO 4034, ISO 4035, ISO 4036, ISO 8673, ISO 8674 and ISO 8675) ;
- d) hexagon flanged bolts (ISO 4162 and ISO 8102) ;
- e) hexagon flanged screws : 1)
- f) hexagon flanged nuts (ISO 4161, ISO 7043 and ISO 7044) ;
- g) structural bolting (ISO 4775, ISO 7411 to ISO 7414 and ISO 7417).

## 1 Scope and field of application

This International Standard gives specifications for hexagon head bolts with threads from M5 up to and including M64 of product grade C.

If, in special cases, specifications other than those listed in this International Standard are required, they should be selected from existing International Standards, for example ISO 261, ISO 888, ISO 898-1, ISO 965-2 and ISO 4759-1.

1) These will form the subject of future International Standards.

## 2 References

ISO 225, *Fasteners — Bolts, screws and nuts — Symbols and designations of dimensions.*

ISO 261, *ISO general purpose metric screw threads — General plan.*

ISO 888, *Bolts, screws and studs — Nominal lengths and thread lengths for general purpose bolts and screws.*

ISO 898-1, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

ISO 965-2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose bolt and nut threads — Medium quality.*

ISO 3269, *Fasteners — Acceptance inspection.*

ISO 4042, *Threaded components — Electroplated coatings.*<sup>1)</sup>

ISO 4759-1, *Tolerances for fasteners — Part 1: Bolts, screws and nuts with thread diameters  $\geq 1,6$  and  $\leq 150$  mm and product grades A, B and C.*

ISO 8992, *Fasteners — General requirements for bolts, screws, studs and nuts.*<sup>1)</sup>

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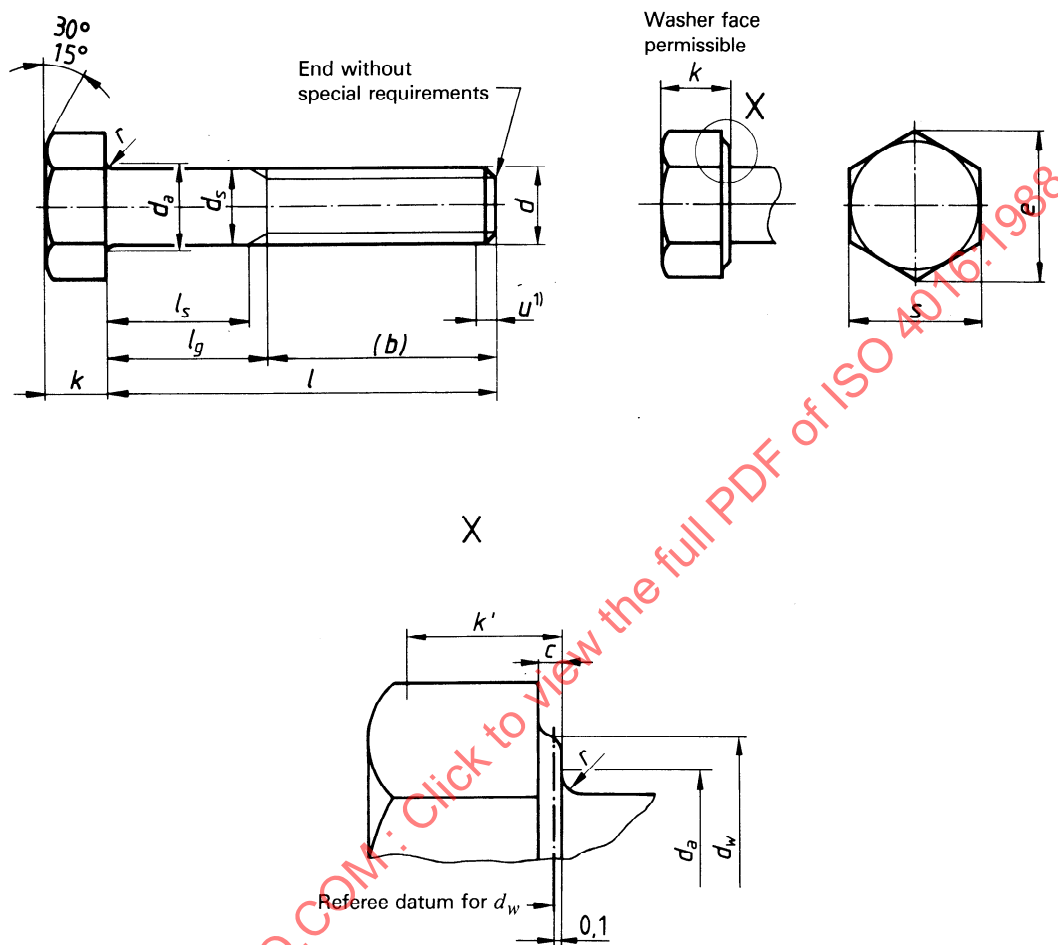
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1) At present at the stage of draft.

### 3 Dimensions

NOTE — Symbols and designations of dimensions are specified in ISO 225.

Dimensions in millimetres



1) Incomplete thread  $u \leq 2 P$ .

Table 1 — Preferred threads

| Thread (d)      |             | M5                                       | M6             | M8             | M10            | M12            | M16            | M20            | M24            | M30            | M36            | M42            | M48            | M56            | M64            |
|-----------------|-------------|------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| p <sup>1)</sup> |             | 0,8                                      | 1              | 1,25           | 1,5            | 1,75           | 2              | 2,5            | 3              | 3,5            | 4              | 4,5            | 5              | 5,5            | 6              |
| h ref           | 2)          | 16                                       | 18             | 22             | 26             | 30             | 38             | 46             | 54             | 66             | —              | —              | —              | —              | —              |
|                 | 3)          | —                                        | —              | —              | —              | —              | 44             | 52             | 60             | 72             | 84             | 96             | 108            | —              | —              |
|                 | 4)          | —                                        | —              | —              | —              | —              | —              | —              | 73             | 85             | 97             | 109            | 121            | 137            | 153            |
| c               | max.        | 0,5                                      | 0,5            | 0,6            | 0,6            | 0,6            | 0,8            | 0,8            | 0,8            | 0,8            | 0,8            | 0,8            | 1              | 1              | 1              |
| d <sub>u</sub>  | max.        | 6                                        | 7,2            | 10,2           | 12,2           | 14,7           | 18,7           | 24,4           | 28,4           | 35,4           | 42,4           | 48,6           | 56,6           | 67             | 75             |
| d <sub>s</sub>  | max.        | 5,48                                     | 6,48           | 8,58           | 10,58          | 12,7           | 16,7           | 20,84          | 24,84          | 30,84          | 37             | 43             | 49             | 57,2           | 65,2           |
| d <sub>s</sub>  | min.        | 4,52                                     | 5,52           | 7,42           | 9,42           | 11,3           | 15,3           | 19,16          | 23,16          | 29,16          | 36             | 41             | 47             | 54,8           | 62,8           |
| d <sub>w</sub>  | min.        | 6,74                                     | 8,74           | 11,47          | 14,47          | 16,47          | 22             | 27,7           | 33,25          | 42,75          | 51,11          | 59,95          | 69,45          | 78,66          | 88,16          |
| e               | min.        | 8,63                                     | 10,89          | 14,2           | 17,59          | 19,85          | 26,17          | 32,95          | 39,55          | 50,85          | 60,79          | 71,3           | 82,6           | 93,56          | 104,86         |
| k               | nom.        | 3,5                                      | 4              | 5,3            | 6,4            | 7,5            | 10             | 12,5           | 15             | 18,7           | 22,5           | 26             | 30             | 35             | 40             |
| k               | min.        | 3,125                                    | 3,625          | 4,925          | 5,95           | 7,05           | 9,25           | 11,6           | 14,1           | 17,65          | 21,45          | 24,95          | 28,95          | 33,75          | 38,75          |
| k <sup>2)</sup> | max.        | 3,875                                    | 4,375          | 5,675          | 6,85           | 7,95           | 10,75          | 13,4           | 15,9           | 19,75          | 23,55          | 27,05          | 31,05          | 36,25          | 41,25          |
| r               | min.        | 2,19                                     | 2,54           | 3,45           | 4,17           | 4,94           | 6,48           | 8,12           | 9,87           | 12,36          | 15,02          | 17,47          | 20,27          | 23,63          | 27,13          |
| r               | min.        | 0,2                                      | 0,25           | 0,4            | 0,4            | 0,6            | 0,6            | 0,8            | 0,8            | 1              | 1              | 1,2            | 1,6            | 2              | 2              |
| s               | nom. = max. | 8                                        | 10             | 13             | 16             | 18             | 24             | 30             | 36             | 46             | 55             | 65             | 75             | 85             | 95             |
| s               | min.        | 7,64                                     | 9,64           | 12,57          | 15,57          | 17,57          | 23,16          | 29,16          | 35             | 45             | 53,8           | 63,1           | 73,1           | 82,8           | 92,8           |
| l               |             | l <sub>s</sub> and l <sub>g</sub> (6, 7) |                |                |                |                |                |                |                |                |                |                |                |                |                |
| nom.            | min.        | l <sub>s</sub>                           | l <sub>g</sub> | l <sub>s</sub> | l <sub>g</sub> | l <sub>s</sub> | l <sub>g</sub> | l <sub>s</sub> | l <sub>g</sub> | l <sub>s</sub> | l <sub>g</sub> | l <sub>s</sub> | l <sub>g</sub> | l <sub>s</sub> | l <sub>g</sub> |
| 25              | 23,95       | 5                                        | 9              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              |
| 30              | 28,95       | 10                                       | 14             | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              |
| 35              | 33,75       | 15                                       | 19             | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              |
| 40              | 38,75       | 20                                       | 24             | 17             | 22             | 11,75          | 18             | —              | —              | —              | —              | —              | —              | —              | —              |
| 45              | 43,75       | 25                                       | 29             | 22             | 27             | 16,75          | 23             | 11,5           | 19             | —              | —              | —              | —              | —              | —              |
| 50              | 48,75       | 30                                       | 34             | 27             | 32             | 21,75          | 28             | 16,5           | 24             | —              | —              | —              | —              | —              | —              |
| 55              | 53,5        | —                                        | —              | 32             | 37             | 26,75          | 33             | 21,5           | 29             | 16,25          | 25             | —              | —              | —              | —              |
| 60              | 58,5        | —                                        | —              | 37             | 42             | 31,75          | 38             | 26,5           | 34             | 21,25          | 30             | —              | —              | —              | —              |
| 65              | 63,5        | —                                        | —              | —              | —              | 36,75          | 43             | 31,5           | 39             | 26,25          | 35             | —              | —              | —              | —              |
| 70              | 68,5        | —                                        | —              | —              | —              | 41,75          | 48             | 36,5           | 44             | 31,25          | 40             | —              | —              | —              | —              |
| 80              | 78,5        | —                                        | —              | —              | —              | 51,75          | 58             | 46,5           | 54             | 41,25          | 50             | —              | —              | —              | —              |
| 90              | 88,25       | —                                        | —              | —              | —              | —              | —              | 56,5           | 64             | 51,25          | 60             | —              | —              | —              | —              |
| 100             | 98,25       | —                                        | —              | —              | —              | —              | —              | 66,5           | 74             | 61,25          | 70             | —              | —              | —              | —              |
| 110             | 108,25      | —                                        | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              |
| 120             | 118,25      | —                                        | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              | —              |

For sizes above the stepped line, marked thus —, ISO 4018 is recommended.

|     |     |       |     |
|-----|-----|-------|-----|
| 223 | 243 | 208,5 | 231 |
| 243 | 263 | 228,5 | 251 |
|     |     | 248,5 | 271 |
|     |     | 268,5 | 291 |
|     |     | 288,5 | 311 |

- 1)  $P$  = pitch of the thread.
- 2) For lengths  $l_{\text{nom}} \leq 125$  mm.
- 3) For lengths  $125 \text{ mm} < l_{\text{nom}} \leq 200$  mm.
- 4) For lengths  $l_{\text{nom}} > 200$  mm.
- 5)  $k'_{\text{min}} = 0,7 \text{ k}_{\text{min}}$
- 6)  $l'_{g \text{ max}} = l_{\text{nom}} - b$   
 $l'_{g \text{ min}} = l'_{g \text{ max}} - 5P$
- 7)  $l'_g$  is the minimum grip length.

NOTE – The popular lengths are marked by the shank lengths:

Table 2 — Non-preferred threads

Dimensions in millimetres

| Thread (d)           | M14                                                   | M18                       | M22                       | M27                       | M33                       | M39                       | M45                       | M52                       | M60                       |
|----------------------|-------------------------------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| <i>P</i> 1)          | 2                                                     | 2,5                       | 2,5                       | 3                         | 3,5                       | 4                         | 4,5                       | 5                         | 5,5                       |
| <i>b</i> ref         | 34                                                    | 42                        | 50                        | 60                        | —                         | —                         | —                         | —                         | —                         |
| 2)                   | 40                                                    | 48                        | 56                        | 66                        | 78                        | 90                        | 102                       | 116                       | —                         |
| 3)                   | —                                                     | —                         | 69                        | 79                        | 91                        | 103                       | 115                       | 129                       | 145                       |
| 4)                   | —                                                     | —                         | —                         | —                         | —                         | —                         | —                         | —                         | —                         |
| <i>c</i>             | 0,6                                                   | 0,8                       | 0,8                       | 0,8                       | 0,8                       | 1                         | 1                         | 1                         | 1                         |
| <i>d<sub>a</sub></i> | 16,7                                                  | 21,2                      | 26,4                      | 32,4                      | 38,4                      | 45,4                      | 52,6                      | 62,6                      | 71                        |
| <i>d<sub>s</sub></i> | 14,7                                                  | 18,7                      | 22,84                     | 27,84                     | 34                        | 40                        | 46                        | 53,2                      | 61,2                      |
| <i>d<sub>w</sub></i> | 13,3                                                  | 17,3                      | 21,16                     | 26,16                     | 32                        | 38                        | 44                        | 50,8                      | 58,8                      |
| <i>d<sub>w</sub></i> | 19,15                                                 | 24,85                     | 31,35                     | 38                        | 46,55                     | 55,86                     | 64,7                      | 74,2                      | 83,41                     |
| <i>e</i>             | 22,78                                                 | 29,56                     | 37,29                     | 45,2                      | 55,37                     | 66,44                     | 76,95                     | 88,25                     | 99,21                     |
| <i>k</i>             | 8,8                                                   | 11,5                      | 14                        | 17                        | 21                        | 25                        | 28                        | 33                        | 38                        |
| <i>k</i>             | 8,35                                                  | 10,6                      | 13,1                      | 16,1                      | 19,95                     | 23,95                     | 26,95                     | 31,75                     | 36,75                     |
| <i>k</i> 5)          | 9,25                                                  | 12,4                      | 14,9                      | 17,9                      | 22,05                     | 26,05                     | 29,05                     | 34,25                     | 39,25                     |
| <i>k</i> 5)          | 5,85                                                  | 7,42                      | 9,17                      | 11,27                     | 13,97                     | 16,77                     | 18,87                     | 22,23                     | 25,73                     |
| <i>r</i>             | 0,6                                                   | 0,6                       | 0,8                       | 1                         | 1                         | 1                         | 1,2                       | 1,6                       | 2                         |
| <i>s</i>             | 21                                                    | 27                        | 34                        | 41                        | 50                        | 60                        | 70                        | 80                        | 90                        |
| <i>s</i>             | 20,16                                                 | 26,16                     | 33                        | 40                        | 49                        | 58,8                      | 68,1                      | 78,1                      | 87,8                      |
| <i>l</i>             | <i>l<sub>s</sub></i> and <i>l<sub>g</sub></i> (6), 7) |                           |                           |                           |                           |                           |                           |                           |                           |
| nom.                 | min.                                                  | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. | <i>l<sub>s</sub></i> min. |
| 60                   | 16                                                    | 25,5                      | 38                        | 50                        | 62                        | 74                        | 86                        | 98                        | 110                       |
| 65                   | 21                                                    | 35,5                      | 48                        | 60                        | 72                        | 84                        | 96                        | 108                       | 120                       |
| 70                   | 26                                                    | 45,5                      | 58                        | 70                        | 82                        | 94                        | 106                       | 118                       | 130                       |
| 80                   | 36                                                    | 55,5                      | 68                        | 80                        | 92                        | 104                       | 116                       | 128                       | 140                       |
| 90                   | 46                                                    | 65,5                      | 78                        | 90                        | 102                       | 114                       | 126                       | 138                       | 150                       |
| 100                  | 56                                                    | 75,5                      | 88                        | 100                       | 112                       | 124                       | 136                       | 148                       | 160                       |
| 110                  | 66                                                    | 85,5                      | 98                        | 110                       | 122                       | 134                       | 146                       | 158                       | 170                       |
| 120                  | 76                                                    | 95,5                      | 108                       | 120                       | 132                       | 144                       | 156                       | 168                       | 180                       |
| 130                  | 86                                                    | 105,5                     | 118                       | 130                       | 142                       | 154                       | 166                       | 178                       | 190                       |
| 140                  | 96                                                    | 115,5                     | 128                       | 140                       | 152                       | 164                       | 176                       | 188                       | 200                       |
| 150                  | 106                                                   | 125,5                     | 138                       | 150                       | 162                       | 174                       | 186                       | 198                       | 210                       |
| 160                  | 116                                                   | 135,5                     | 148                       | 160                       | 172                       | 184                       | 196                       | 208                       | 220                       |

For sizes above the stepped line, marked thus —, ISO 4018 is recommended.



[illegible]

- 1)  $P$  = pitch of the thread.
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- 3) For lengths  $125 \text{ mm} < l_{\text{nom}} \leq 200$  mm.
- 4) For lengths  $l_{\text{nom}} > 200$  mm.
- 5)  $k'_{\text{min}} = 0,7 k_{\text{min}}$
- 6)  $l'_{g \text{ max}} = l_{\text{nom}} - b$   
 $l'_{g \text{ min}} = l'_{g \text{ max}} - 5 P$
- 7)  $l_g$  is the minimum grip length.

**NOTE** — The popular lengths are marked by the shank lengths.