

ASME B32.100-2016

[Revision of ASME B32.100-2005 (R2011)]

Preferred Metric Sizes for Flat, Round, Square, Rectangular, and Hexagonal Metal Products

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AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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(Revision of ASME B32.100-2005)

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The American Society of
Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

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FOREWORD

The U.S. Department of Commerce, in its July 1971 report to Congress, titled "A Metric America — A Decision Whose Time Has Come," recommended that the United States should change to the metric system of measurement through a coordinated national program. This action, along with subsequent increased metric activity in industry, resulted in a number of requests from producers and users that the B32 Committee develop preferred series of metric sizes for the various forms of wrought metal mill products.

The B32.100 standard is based on the previously published standards B32.3M-1984 and B32.4M-1980. Development of these standards was started in 1973. The proposal received Standards Committee B32 approval on June 4, 1974. It was subsequently approved by the sponsor and submitted to the American National Standards Institute (ANSI) for designation as an American National Standard. This was granted on July 9, 1974. The last edition was approved by ANSI on September 24, 1984 and reaffirmed in 1994.

The sizes in this Standard are derived from a list of preferred metric sizes in which each number is approximately 60% greater than the number preceding it (ANSI B4.2 or ISO 497 Series R5'). Second Choice sizes are in increments of 25% (Series R10') and Third Choice sizes in increments of 12% (Series R20'). Some deviations from this principle occur as the result of minor rounding. The selected sizes also reflect standard material sizes in ISO and national standards in traditional metric countries.

In 2002, the B32 Committee established a task force to draft a new metric standard for the product group: ASME B32.100-200X Preferred Metric Sizes for Flat, Round, Square, Rectangular, and Hexagonal Metal Products.

Material tolerances must be included in order to fully define the size of a product. International or leading national metric standards data were used as the basis for the tolerance data included in this Standard. References to the sources of these tolerances have been made, and a list of related standards are shown in [Nonmandatory Appendix A](#).

The 2005 edition was approved by ANSI on February 11, 2005.

The present edition deleted obsolete references, the year date of the referenced standards have been deleted, and some corrections were made to [Nonmandatory Appendix A](#). The present edition also includes additional data and clarification related to [para. 5.8](#) and [Table 13](#).

The present edition was approved by ANSI on June 29, 2016.

ACKNOWLEDGEMENT

Data shown in this Standard were developed with the help of the global standards material published in the book, *Metric Standards for Worldwide Manufacturing*, with the permission of the publishers, ASME Press and *G0metricUSA.org*.

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Metal and Metal Alloy Wrought Mill Product Nominal Sizes

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The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

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Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the B32 Standards Committee at the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

- Subject: Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
- Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.
- Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
- Proposed Reply(ies): Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
- Background Information: Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

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PREFERRED METRIC SIZES FOR FLAT, ROUND, SQUARE, RECTANGULAR, AND HEXAGONAL METAL PRODUCTS

1 SCOPE

This Standard establishes a preferred series of metric thicknesses, widths, and lengths for flat metal products of rectangular cross section. The thicknesses and widths shown in this Standard are also applicable to base metals that may be coated in later operations. This Standard also establishes a preferred series of metric sizes for round, square, rectangular, and hexagonal metal products.

2 GENERAL

The sizes in this Standard provide an orderly series of thicknesses for all flat metal products and widths for rectangular cross-section metal products. The series was developed to provide a reasonable selection of metal thicknesses from 0.050 mm to 300 mm and of metal widths from 10 mm to 5 000 mm. In each case, the series provides for some second, third, and sometimes fourth choice sizes (thicknesses and widths) to cover instances where selection from the primary preferred sizes may be inadequate. Sufficient coverage in logical steps is presented in the tables to adequately serve most of the general purpose requirements of industry for flat metal products. This Standard provides an orderly series of lengths for flat metal products.

This Standard also provides a series of sizes for each of round, square, rectangular, and hexagonal forms of metal products used for general applications. The series was developed to provide a reasonable selection of metal diameters from 0.020 mm to 320 mm for rounds and distance-across-flats from 3 mm to 300 mm for squares, various cross-section sizes from 1.6 mm by 2 mm to 100 mm by 200 mm for rectangles, and from 1.5 mm to 150 mm for hexagons. The series provides for some second, third, and fourth choice diameters for rounds and second and third choice distance-across-flats for squares and hexagons, where selection from the primary preferred sizes may be inadequate. The series also provides for preferred lengths of rounds, squares, rectangles, and hexagons. Sufficient coverage in logical steps is presented in the tables to adequately serve most of the general purpose requirements of industry for round, square, rectangular, and hexagonal metal products.

It is recognized that for some applications, particularly large-volume requirements in some metals for specific end uses, precise engineering requirements dictate a need for sizes other than those presented in this

Standard. This Standard is in no way meant to preclude the use of such sizes where they are required. However, for general purpose applications or where requirements permit some latitude in the selection of thickness or thickness/width/length combinations, the simplified preferred sizes given in this Standard should facilitate interchangeability of metals in design, reduce inventories, and increase the availability of warehouse stocks of those sizes commonly used for general purpose applications. In such instances, the use of sizes listed in this Standard is to be encouraged.

All of the sizes included in this Standard are not necessarily produced in all metals and grades. Producers or distributors should be consulted to determine availability of a particular thickness or thickness/width combination for a given metal product.

3 USE OF TABLES

Wherever possible, sizes should be selected from the columns headed "First Choice." Only if no size in the preferred list is suitable should a selection be made from the columns headed "Second Choice" or "Third Choice." Lengths should be selected from the preferred list.

4 BASIS OF TABLES

The sizes in this Standard are derived from a list of preferred metric sizes in which each number is approximately 60% greater than the number preceding it [ANSI B4.2 (Preferred Metric Limits and Fits) or ISO 497 (Guide to the choice of series of preferred numbers and series containing more rounded values of preferred numbers) Series R5']. Second Choice sizes are in increments of 25% (Series R10') and Third Choice sizes in increments of 12% (Series R20'). Some deviations from this principle occur as the result of minor rounding. The selected sizes also reflect standard material sizes in ISO and national standards in traditional metric countries.

5 TOLERANCES

Material product tolerances are shown in applicable international or national product standards. Normal tolerances shown in international standards are generally larger and could be up to twice as large for metric material compared with customary inch tolerances used in the U.S. Only a few major product groups will be covered by this Standard, and they are specified in [paras. 5.1](#) through [5.8](#).

5.1 Hot-Rolled Steel Sheets

Preferred sizes for hot-rolled steel sheets are shown in [Tables 1](#) through [3](#). Tolerances for hot-rolled steel sheets are specified in ISO 4995 (Hot-rolled steel sheet of structural quality) and ISO 5002 (Hot-rolled and cold-reduced electrolytic zinc-coated carbon steel sheet of commercial and drawing qualities) and shown in [Table 9](#).

5.2 Cold-Rolled Steel Sheets

Preferred sizes for cold-rolled steel sheets are shown in [Tables 1](#) through [3](#). Tolerances for cold-rolled steel sheets are specified in ISO 4997 (Cold-reduced carbon steel sheet of structural quality) and shown in [Table 10](#).

5.3 Hot-Rolled Steel Bars

Preferred sizes for hot-rolled steel bars are shown in [Tables 4](#) through [8](#). Note that in [Tables 4](#), [5](#), [6](#), and [13](#), D is the Basic Size, which is defined as the size to which limits and tolerances are assigned. Tolerances for hot-rolled steel bars are specified in ISO 1035-4 (Hot-rolled steel bars — Part 4: Tolerances) and shown in [Table 11](#).

5.4 Cold-Finished Round Steel Bars

Preferred sizes for cold-finished round steel bars are shown in [Tables 4](#) and [7](#). Cold-finished round steel bars held to the ISO tolerances h11, h9, h7, and h6 are listed in [Table 13](#).

5.5 Cold-Finished Square Steel Bars

Preferred sizes for cold-finished square steel bars are shown in [Tables 5](#) and [7](#). Cold-finished square steel bars held to the ISO tolerances h11 up to and including 65 mm and h12 for larger sizes are listed in [Table 13](#).

5.6 Cold-Finished Hex Steel Bars

Preferred sizes for cold-finished hex steel bars are shown in [Tables 6](#) and [7](#). Cold-finished hex steel bars held to the ISO tolerances h11 up to and including 65 mm and h12 for larger sizes are listed in [Table 13](#).

5.7 Hot-Rolled Rectangular Steel Bars

Preferred sizes for hot-rolled rectangular steel bars are shown in [Tables 7](#) and [8](#). Tolerances for hot-rolled steel bars are specified in ISO 1035-4 and shown in [Table 12](#).

5.8 Cold-Finished Rectangular Steel Bars

Preferred sizes for cold-finished rectangular steel bars are shown in [Tables 7](#) and [8](#). Cold-finished rectangular steel bars are held to the ISO tolerances specified in [Table 13](#) with the following limitations. For thicknesses (B) from 1.5 mm to 30 mm and widths (A) from 5 mm to 100 mm, ISO h11 tolerances are specified. For thicknesses over 30 mm, ISO h13 tolerances are specified. For widths over 100 mm, consult supplier.

Table 1 Preferred Thickness for All Flat Metal Products, mm

First Choice	Second Choice	Third Choice	First Choice	Second Choice	Third Choice
...	0.05	...	4	...	...
0.06	...	...	...	...	4.5
...	0.08	...	...	5	...
0.1	...	...	...	...	5.5
...	...	0.11	6	...	...
...	0.12	...	...	...	7
...	...	0.14	...	...	7.5
0.16	...	...	...	8	...
...	...	0.18	...	...	9
...	0.2	...	10	...	...
...	...	0.22	...	...	11
0.25	...	...	...	12	...
...	...	0.28	...	...	14
...	0.3	...	...	...	15
...	...	0.35	16	...	...
0.4	...	...	...	...	18
...	...	0.45	...	20	...
...	0.5	...	...	...	22
...	...	0.55	25	...	...
0.6	...	...	...	...	28
...	...	0.65	...	30	...
...	...	0.7	...	...	32
...	...	0.75	...	...	35
...	0.8	...	...	...	38
...	...	0.9	40	...	...
1	...	...	...	...	45
...	...	1.1	...	50	...
...	1.2	...	...	...	55
...	...	1.4	60	...	...
...	...	1.5	...	...	70
1.6	...	...	...	80	...
...	...	1.7	...	...	90
...	...	1.8	100	...	...
...	2	...	...	...	110
...	...	2.2	...	120	...
...	...	2.3	...	...	130
2.5	...	...	...	...	140
...	...	2.6	...	...	150
...	...	2.8	160	...	...
...	3	...	...	...	180
...	...	3.2	...	200	...
...	...	3.5	250	...	...
...	...	3.8	...	300	...

Table 2 Preferred Widths for Flat Metal Products, mm

First Choice	Second Choice	Third Choice	First Choice	Second Choice	Third Choice
...	2	...	...	...	130
2.5	...	...	...	140	...
...	3	...	...	...	150
4	...	...	160	...	...
...	5	...	...	...	180
6	...	...	...	200	...
...	8	...	...	...	225
10	...	...	250	...	...
...	12	...	...	...	280
16	...	...	...	300	...
...	20	...	400	...	...
25	...	...	...	500	...
...	30	...	600	...	...
...	...	35	...	...	700
40	...	...	...	800	...
...	...	45	...	...	900
...	50	...	1 000	...	...
...	...	55	...	1 200	...
60	...	...	1 600	...	1 500
...	...	70	...	2 000	...
...	80	...	2 500	...	...
...	...	90	...	3 000	...
100	...	...	...	...	3 500
...	...	110	4 000	...	...
...	120	...	...	5 000	...

Table 3 Preferred Lengths for Flat Metal Products, mm

First Choice	Second Choice	Third Choice
...	2 000	...
2 500	...	...
...	3 000	...
...	...	3 500
4 000	...	...
...	...	4 500
...	5 000	...
6 000	...	...
...	8 000	...
10 000	...	...
...	12 000	...
...	...	14 000
16 000	...	...
...	...	18 000

Table 4 Preferred Diameters, D , of Round Metal Products, mm

First Choice	Second Choice	Third Choice	First Choice	Second Choice	Third Choice	First Choice	Second Choice	Third Choice
...	0.02	...	...	...	2.4	...	...	45
...	...	0.022	2.5	...	...	...	...	48
0.025	...	...	...	...	2.6	...	50	...
...	...	0.028	...	...	2.8	...	...	55
...	0.03	...	...	3	...	...	...	56
...	...	0.035	...	...	3.2	60	...	...
0.04	...	...	...	...	3.5	...	...	63
...	...	0.045	...	...	3.8	...	...	65
...	0.05	...	4	...	...	...	...	70
...	...	0.055	...	...	4.5	...	...	75
0.06	...	...	...	...	4.8	...	80	...
...	...	0.065	...	5	...	...	...	85
...	...	0.07	...	...	5.5	...	...	90
...	0.08	...	6	...	...	...	...	95
...	...	0.09	...	...	6.5	100	...	...
0.1	...	...	...	...	7	...	...	105
...	...	0.11	...	...	7.5	...	...	110
...	0.12	...	...	8	...	...	120	...
...	...	0.14	...	...	8.5	...	...	125
0.16	...	...	...	...	9	...	...	130
...	...	0.18	...	...	9.5	...	...	140
...	0.2	...	10	...	...	...	...	150
...	...	0.22	...	...	11	160	...	...
0.25	...	...	...	12	...	...	...	170
...	...	0.28	...	...	13	...	...	180
...	0.3	...	...	...	14	...	...	190
...	...	0.35	...	...	15	...	200	...
0.4	...	...	16	...	...	...	...	220
...	...	0.45	...	...	17	...	...	240
...	0.5	...	...	...	18	250	...	...
...	...	0.55	...	...	19	...	...	260
0.6	...	...	...	20	...	...	...	280
...	...	...	...	...	21	...	300	...
...	...	0.7	...	...	22	...	...	320
...	0.8	...	...	...	23	...	...	340
...	...	0.9	...	...	24	...	...	350
1	...	...	25	...	...	...	...	360
...	...	1.1	...	...	26	...	...	380
...	1.2	...	...	...	28	400	...	...
...	...	...	...	30	...	...	...	420
...	...	1.4	...	...	32	...	...	440
1.6	...	...	...	...	35	...	...	450
...	...	1.8	...	...	36	...	...	460
...	2	...	...	...	38	...	...	480
...	...	...	40	...	...	...	500	...
...	...	2.2	...	...	42	...	...	...

GENERAL NOTE: Hot-finished round material sizes made to this Standard are interchangeable with those made to ISO 1035-1 (Hot-rolled steel bars — Part 1: Dimensions of round bars).

Table 5 Preferred Across Flat Sizes, *D*, of Square Metal Products, mm

First Choice	Second Choice	Third Choice	First Choice	Second Choice	Third Choice
...	3	...	...	...	45
4	...	...	...	50	...
...	5	...	...	...	55
6	...	...	60	...	...
...	8	...	...	...	70
10	...	...	...	80	...
...	12	...	...	...	90
...	...	14	100	...	...
16	...	...	...	...	110
...	...	18	...	120	...
...	20	...	...	...	140
...	...	22	160	...	...
25	...	...	...	...	180
...	...	28	...	200	...
...	30	...	...	...	220
...	...	35	250	...	...
40	...	...	...	300	...

GENERAL NOTE: Hot-finished square material sizes made to this Standard are interchangeable with those made to ISO 1035-2 (Hot-rolled steel bars — Part 2: Dimensions of square bars).

Table 6 Preferred Across Flat Sizes, *D*, of Hexagonal Metal Products, mm

First Choice	Second Choice	Third Choice	First Choice	Second Choice	Third Choice
...	1.5	...	30	...	...
...	2	...	...	32	...
...	2.5	...	34	...	...
3	...	...	36	...	...
...	3.2	...	41	...	...
4	...	...	46	...	...
5	...	...	50	...	...
...	5.5	...	55	...	...
6	...	...	60	...	...
...	7	...	65	...	...
8	...	...	70	...	...
10	...	...	75	...	...
12	...	...	80	...	...
...	13	...	85	...	...
14	...	...	90	...	...
...	15	...	95	...	...
16	...	...	100	...	...
...	17	...	105	...	...
18	...	...	110	...	...
...	19	...	115	...	...
21	...	...	120	...	...
...	22	...	130	...	...
24	...	...	135	...	...
27	...	...	145	...	...
...	...	...	150	...	...

Table 7 Preferred Lengths of Round, Square, Rectangular, and Hexagonal Metal Products, mm

First Choice	Second Choice	Third Choice
1 000	...	...
...	2 000	...
2 500	...	...
...	3 000	...
...	...	3 500
...	...	3 700
4 000	...	...
...	...	4 500
...	5 000	...
6 000	...	...
...	8 000	...
10 000	...	...
...	12 000	...
...	...	14 000
16 000	...	...
...	...	18 000

Table 8 Preferred Across Flat Sizes of Rectangular Metal Products, mm

Choice of Width, A			Thickness, B																		
			First Choice										Second Choice								
First	Second	Third	1.6	2.5	4	6	10	16 (1)	25	40	60	100	2	3	5	8	12	20	30	50	80
...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	5	...	...	C	...	...	...	...	...	...	...	...	C	C	...	...	...	...	...	...	...
6	...	...	...	C	C	...	...	...	...	...	...	...	C	C	...	...	...	...	...	...	...
...	8	...	C	C	X	C	...	...	...	...	...	...	C	X	C	...	...	...	...	...	...
10	...	...	C	C	X	X	...	...	...	...	...	...	C	X	C	...	...	...	...	...	...
...	12	...	C	C	X	X	...	...	...	...	...	...	C	X	C	...	...	...	...	...	...
16	...	...	C	C	X	X	X	...	...	...	...	...	C	X	C	X	...	...	...	...	...
...	20	...	C	C	X	X	X	C	...	...	...	...	C	X	X	X	X	C	...	...	...
25	...	...	...	C	X	X	X	C	...	...	...	...	C	X	X	X	X	C	...	...	...
...	30	...	...	C	X	X	X	X	C	...	...	...	C	X	X	X	X	X	...	...	...
...	...	35	...	C	C	X	X	X	C	...	...	...	C	C	X	X	X	X	...	...	...
40	...	...	...	...	C	X	X	X	X	...	...	...	C	C	X	X	X	X	C	...	...
...	...	45	...	...	C	X	X	X	X	...	...	...	C	C	X	X	X	X	C	...	...
...	50	...	...	...	C	X	X	X	X	...	...	...	C	C	X	X	X	X	X	...	...
60	...	...	...	...	C	X	X	X	X	C	...	...	...	C	X	X	X	X	X	...	...
...	...	70	...	...	...	X	X	X	X	C	...	...	...	...	X	X	X	X	X	...	...
...	80	...	...	...	...	X	X	X	X	X	...	...	...	...	X	X	X	X	X	X	...
...	...	90	...	...	...	X	X	X	X	X	...	...	...	...	X	X	X	X	X	X	...
100	...	...	...	...	...	X	X	X	X	X	...	...	...	...	X	X	X	X	X	X	...
...	...	110	...	...	...	H	H	H	H	H	...	...	...	...	H	H	H	H	H	H	...
...	120	...	...	...	...	H	H	H	H	H	...	...	...	...	H	H	H	H	H	H	...
...	...	130	...	...	...	H	H	H	H	H	...	...	...	...	H	H	H	H	H	H	...
...	...	140	...	...	...	H	H	H	H	H	...	...	...	...	H	H	H	H	H	H	...
...	...	150	...	...	...	H	H	H	H	H	...	...	...	...	H	H	H	H	H	H	...
160	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	180	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	200	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

GENERAL NOTES:
 (a) Hot-finished rectangular material sizes made to this Standard are interchangeable with those made to ISO 1035-3 (Hot-rolled steel bars — Part 3: Dimensions of flat bars).
 (b) X = hot and cold finished, C = cold finished, and H = hot finished.
 NOTE: (1) The ISO 1035-3 standard specifies the 15-mm thickness.

Table 9 Thickness Tolerances for Hot-Rolled Steel Sheet of Structural Qualities (ISO-4995, ISO 5002), mm

Width	Thickness					
	Over 1.6 to 2	Over 2 to 2.5	Over 2.5 to 3	Over 3 to 4	Over 4 to 5	Over 5 to 6
Over 600 to 1200	0.17	0.18	0.20	0.22	0.24	0.26
Over 1200 to 1500	0.19	0.21	0.22	0.24	0.26	0.28
Over 1500 to 1800	0.21	0.23	0.24	0.26	0.28	0.29
Over 1800	...	0.25	0.26	0.27	0.29	0.31

Table 10 Thickness Tolerances for Cold-Rolled Steel Sheet of Structural Qualities (ISO 4997), mm

Width	Thickness								
	Over 0.36 to 0.4	Over 0.4 to 0.6	Over 0.6 to 0.8	Over 0.8 to 1	Over 1 to 1.2	Over 1.2 to 1.6	Over 1.6 to 2	Over 2 to 2.5	Over 2.5 to 3
Over 600 to 1200	0.05	0.06	0.08	0.09	0.10	0.12	0.14	0.17	0.20
Over 1200 to 1500	0.06	0.07	0.09	0.10	0.11	0.13	0.15	0.18	0.21
Over 1500 to 1800	...	0.09	0.10	0.11	0.13	0.15	0.18	0.20	0.23

Table 11 Tolerances for Hot-Rolled, Round, Square, and Hex Steel Bars (ISO 1035-4), mm

Nominal Sizes [Note (1)]		Tolerances on Size for Classes		
Over	Up to and Including	N	F	S [Note (2)]
...	15	±0.4	±0.3	±0.2
15	25	±0.5	±0.4	±0.25
25	35	±0.6	±0.5	±0.3
35	50	±0.8	±0.6	±0.4
50	80	±1	±0.8	±0.5 [Note (3)]
80	100	±1.3	±1	...
100	120	±1.6	±1.3	...
120	160	±2	±1.6	...
160	200	±2.5	±2	...
200	...	±1.5% of size	±1.2 of size	...

NOTES:

(1) Diameter of round bars, distance-across-flats of square and hex bars.

(2) Applicable to round bars only.

(3) Applicable only to sizes up to and including 65 mm. For larger sizes, the tolerances should be agreed on at the time of ordering.

Table 12 Tolerances for Hot-Rolled Flat Bars (ISO 1035-4), mm

Nominal Widths			Nominal Thickness		Tolerances on Thicknesses for Nominal Widths, <i>b</i> , mm	
Over	Up to and Including	Tolerances on Width	Over	Up to and Including	<i>b</i> ≤ 50	50 < <i>b</i> < 150
...	50	±0.8	...	20	±0.4	±0.5
50	75	±1.2	20	40	±0.8	±1
70	100	±1.5	40	...	...	±1.5
100	125	±2	...	...	...	...
125	150	±2.5	...	...	...	...