INTERNATIONAL STANDARD

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Second edition
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Wrought aluminium and aluminium alloys — Cold-drawn rods/bars, tubes and wires —

Part 6: Tolerances on form and dimensions for drawn round tubes

Aluminium et alliages d'aluminium corroyés — Barres, tubes et fils étirés à froid —

Partie 6: Tolérances sur forme et dimensions pour tubes ronds étirés

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 6, *Wrought aluminium and aluminium alloys*.

This second edition cancels and replaces the first edition (ISO 6363-6:2012), which has been technically revised. The main changes are as follows:

— in Clause 4, Table 1 has been separated into Table 1 and Table 2 by alloy group;

— errors have been corrected and expressions modified throughout.

A list of all parts in the ISO 6363 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Wrought aluminium and aluminium alloys — Cold-drawn rods/bars, tubes and wires —

Part 6: Tolerances on form and dimensions for drawn round tubes

1 Scope

This document specifies the tolerances on form and dimensions of wrought aluminium and aluminium alloy drawn round tubes (seamless and porthole).

This document is applicable to cold-drawn round tubes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6363-1, *Wrought aluminium and aluminium alloys — Cold-drawn rods/bars, tubes and wires — Part 1: Technical conditions for inspection and delivery*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6363-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Materials

Alloys mentioned in this document are listed in ISO 6362-7.

NOTE Four-digit numerical designations are completely identical with Registration of International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys (known as "Teal sheets")[1].

For the purposes of this document, wrought aluminium and aluminium alloys are divided into two groups, which correspond to varying difficulty whenever manufacturing the products.

The division of the most commonly alloys used in general engineering into Group I and Group II is specified in Table 1 and Table 2, respectively.

Grouping of other alloys is subject to agreement between the purchaser and supplier.

Table 1 — Alloy Group I

Alloy system	Alloy number
Pure aluminium	1050, 1050A, 1070, 1100, 1200, 1350
Al-Mn system alloy	3003, 3021, 3102, 3103, 3203,
Al-Mg system alloy	5005, 5005A, 5019, 5049, 5050, 5051, 5051A, 5052, 5056, 5083, 5086, 5154, 5154A, 5251, 5754

Table 2 — Alloy Group II (all aluminium alloys except those given in alloy Group I)

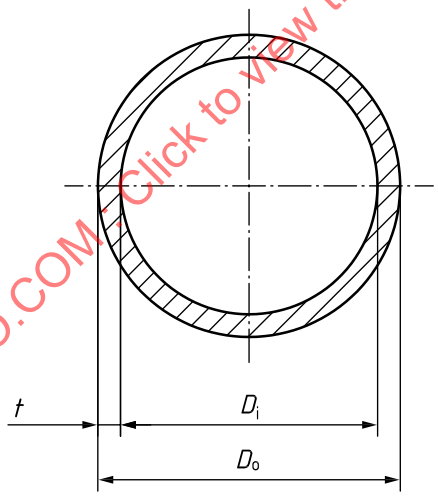
Alloy system	Alloy number
Al-Cu-Mg system alloy	2007, 2011, 2011A, 2014, 2014A, 2017, 2017A, 2024, 2030
Al-Mg-Si system alloy	6018, 6056, 6060, 6061, 6063, 6063A, 6081, 6082, 6181, 6261, 6262, 6463
Al-Zn-Mg system alloy	7003, 7005, 7020, 7021, 7022, 7049A, 7050, 7075, 7108, 7108A, 7204

5 Tolerances on dimensions

5.1 General

Whenever outside diameter, D_o, inside diameter, D_i, and wall thickness, t, are all specified, standard tolerances shall apply to any two of these dimensions, but not to all three. As a result, the purchaser shall only state two nominal dimensions on any given order.

For outside diameter, inside diameter and wall thickness, t, see Figure 1.



Key

D_i inside diameter (ID)

D_o outside diameter (OD)

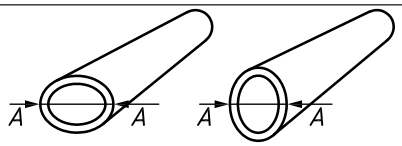
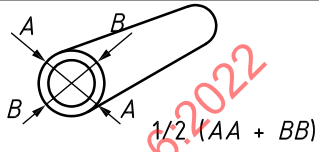
Figure 1 — Round tube

5.2 Diameter — Round tube

Tolerances on diameter for round tubes shall be in accordance with Table 3.

Table 3 — Tolerances on diameter for round tubes

Dimensions in millimetres

Diameter (OD or ID)	Tolerance on diameter for round tubes		
	Maximum allowable deviation of diameter at any point from specified diameter[a]		Maximum allowable deviation of mean diameter from specified diameter[b]
			
	Alloy Group I[c]	Alloy Group II[c]	Alloy Groups I and II[c]
4 ≤ OD or ID ≤ 12	±0,08	±0,15	±0,08
12 < OD or ID ≤ 25	±0,10	±0,20	±0,10
25 < OD or ID ≤ 50	±0,13	±0,25	±0,13
50 < OD or ID ≤ 75	±0,15	±0,30	±0,15
75 < OD or ID ≤ 125	±0,20	±0,41	±0,20
125 < OD or ID ≤ 150	±0,25	±0,51	±0,25
150 < OD or ID ≤ 200	±0,38	±0,76	±0,38
200 < OD or ID ≤ 250	±0,51	±1,0	±0,51
250 < OD or ID ≤ 300	±0,64	±1,3	±0,64
300 < OD or ID ≤ 320	±0,76	±1,5	±0,76

Whenever the tolerance is specified only for either the plus or the minus side, the values in this table shall be doubled.

Tolerances on dimensions exceeding the specified range shall be agreed upon between the purchaser and the supplier.

[a] These values are not applied to the tubes of temper grade O, coiled tubes and tubes with wall thickness less than 2,5 % of specified outside diameter.

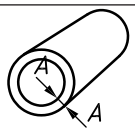
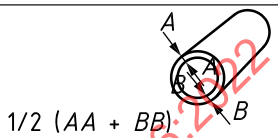
[b] The mean diameter is defined as the average value of measurements carried out at two arbitrary points at right angles to each other.

[c] See Table 1.

5.3 Wall thickness — Round tube

The tolerances on wall thickness variation shall be in accordance with Table 4.

Table 4 — Tolerances on wall thickness of cold-drawn tubes and coiled tube

Wall thickness[a] t	Tolerance			
	Maximum allowable deviation of wall thickness at any point from specified wall thickness			Maximum allowable deviation of mean wall thickness from specified wall thickness[b]
				
	Straight tube		Coiled tube	Straight tube and coiled tube
	Alloy Group I	Alloy Group II	Alloy Groups I and II	Alloy Groups I and II[c]
$0{,}3 \leq t \leq 0{,}8$	±0,05	±10 % of specified wall thickness, but with ±0,08 as minimum	±10 % of specified wall thickness, but with ±0,08 as minimum	±0,05
$0{,}8 < t \leq 1{,}2$	±0,08			±0,08
$1{,}2 < t \leq 2$	±0,10			±0,10
$2 < t \leq 3$	±0,15			±0,13
$3 < t \leq 5$	±0,20			±0,15
$5 < t \leq 7$	±0,30			±0,20
$7 < t \leq 9$	±0,51			±0,38
$9 < t \leq 12$	±0,76			±0,51
$12 < t \leq 15$	±1,0			±0,64
$15 < t \leq 19$	±1,3			±0,76
$19 < t \leq 20$	±1,5			±0,89

Whenever the tolerance is specified only for either the plus or the minus side, the values in this table shall be doubled.

Tolerances on dimensions exceeding the specified range shall be agreed upon between the purchaser and the supplier.

[a] In cases where the outside diameter and inside diameter of tube are specified, apply the tolerance value specified in the column "maximum allowable deviation of wall thickness at any point from specified wall thickness", taking mean wall thickness as the wall thickness.

[b] The mean wall thickness is defined as the average value of measurements carried out at two arbitrary positions facing each other with the pipe axis between them.

5.4 Fixed-length tolerances

Tolerances on fixed length of straight tubes shall be in accordance with Table 5.

Tolerances on fixed length of coiled tubes shall be in accordance with Table 6.

Table 5 — Tolerances on fixed length of straight tubes

Dimensions in millimetres

Outside diameter OD	Tolerance on fixed lengths L		
	$L \leq 3\,500$	$3\,500 < L \leq 9\,000$	$9\,000 < L \leq 15\,000$
$OD \leq 6$	$^{+7}_{0}$	$^{+10}_{0}$	$^{+13}_{0}$
$6 < OD \leq 75$	$^{+4}_{0}$	$^{+7}_{0}$	$^{+10}_{0}$
$75 < OD \leq 150$	$^{+5}_{0}$	$^{+8}_{0}$	$^{+11}_{0}$

Tolerances on dimensions exceeding the range of specified dimensions shall be agreed upon between the purchaser and the supplier.

Table 6 — Tolerances on fixed length of coiled tube

Dimensions in millimetres

Outside diameter OD	Tolerance on fixed lengths of coiled tube L			
	$L \leq 30\,000$	$30\,000 < L \leq 80\,000$	$80\,000 < L \leq 150\,000$	$150\,000 < L$
OD ≤ 30	+5 % −0	±10 %	±15 %	±20 %
When the tolerance is specified only for either the plus or the minus side, the values in this table shall be doubled.				

5.5 Squareness of cut ends

The squareness of cut ends shall be within half of the fixed-length tolerance range specified in Table 5 for both fixed and random lengths. For example, for a fixed-length tolerance of $^{+10}_{0}$ mm, the squareness of cut ends shall be within 5 mm.

6 Tolerances on form

6.1 General

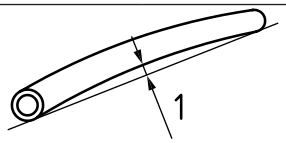
Tolerances on form for O temper shall be subject to agreement between the purchaser and the supplier.

6.2 Straightness

The straightness tolerance of round tubes is specified in Table 7.

Table 7 — Tolerances on straightness of round tube

Dimensions in millimetres

Outside diameter OD	Tolerances on straightness of round tube[a]	
		
	Key 1 straightness	
	Maximum allowable deviation of straightness for any 300 mm length	**Maximum allowable deviation of straightness for total length** L[b]
OD ≤ 9	13	$13 \times \frac{L}{300}$
9 < OD ≤ 150	0,3	$0{,}3 \times \frac{L}{300}$
Tolerance on dimensions exceeding the range of specified dimensions shall be agreed upon between the purchaser and supplier. [a] These are values obtained by placing the tube on a flat surface, so that the mass of the tube minimizes the deviation. These values do not apply to temper grade O. [b] Whenever the total length of tube does not constitute an integral multiple of 300 mm, the tolerance is determined by rounding up fractions to a unit for every 300 mm.		