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**Cold-formed welded structural hollow  
sections of non-alloy and fine grain  
steels —**

**Part 2:  
Dimensions and sectional properties**

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*Profils creux de construction formés à froid, soudés, en acier non allié  
ou à grains fins —  
Partie 2: Dimensions et caractéristiques du profil*

ISO 10799-2:2011

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## Contents

Page

Foreword .....	iv
<b>1</b> <b>Scope</b> .....	<b>1</b>
<b>2</b> <b>Normative references</b> .....	<b>1</b>
<b>3</b> <b>Terms and definitions</b> .....	<b>1</b>
<b>4</b> <b>Symbols</b> .....	<b>1</b>
<b>5</b> <b>Information to be supplied by the purchaser</b> .....	<b>2</b>
<b>6</b> <b>Tolerances</b> .....	<b>2</b>
<b>7</b> <b>Measurement of size and shape</b> .....	<b>4</b>
7.1 <b>General</b> .....	4
7.2 <b>Outside dimension</b> .....	4
7.3 <b>Thickness</b> .....	5
7.4 <b>Out-of-roundness</b> .....	5
7.5 <b>Concavity and convexity</b> .....	5
7.6 <b>Squareness of sides</b> .....	6
7.7 <b>External corner profile</b> .....	6
7.8 <b>Twist</b> .....	7
7.9 <b>Straightness</b> .....	8
<b>8</b> <b>Dimensions and sectional properties</b> .....	<b>8</b>
<b>Annex A (normative) Formulae for calculation of sectional properties</b> .....	<b>25</b>

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10799-2 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 1, *Steel tubes*.

This first edition of ISO 10799-2 cancels and replaces ISO 4019:2001, of which it constitutes a minor revision. In particular, better grouping of several documents by subject area and minor editorial improvements have been carried out.

ISO 10799 consists of the following parts, under the general title *Cold-formed welded structural hollow sections of non-alloy and fine grain steels*.

- Part 1: *Technical delivery conditions*
- Part 2: *Dimensions and sectional properties*

# Cold-formed welded structural hollow sections of non-alloy and fine grain steels —

## Part 2: Dimensions and sectional properties

### 1 Scope

This part of ISO 10799 specifies the tolerances for cold-formed welded circular, square and rectangular structural hollow sections, and gives the dimensions and sectional properties for a range of standard sizes.

NOTE For the technical delivery requirements, see ISO 10799-1.

### 2 Normative references

The following referenced documents are indispensable for the application 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 10799-1, *Cold-formed welded structural hollow sections of non-alloy and fine grain steels — Part 1: Technical delivery conditions*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10799-1 apply.

### 4 Symbols

For the purposes of this document, the symbols given in Table 1 apply.

Table 1 — Symbols

Symbol	Unit	Definition
$A$	cm <sup>2</sup>	Cross-sectional area
$A_s$	m <sup>2</sup> /m	Surface area per metre length
$B$	mm	Nominal length of side of a square hollow section Nominal length of the shorter side of a rectangular hollow section
$C_1; C_2$	mm	Length of external corner profile of a square or rectangular hollow section
$C_t$	cm <sup>3</sup>	Torsional modulus constant
$D$	mm	Nominal outside diameter of a circular hollow section

Table 1 (continued)

Symbol	Unit	Definition
$D_{\max}; D_{\min}$	mm	Maximum and minimum outside diameter of a circular hollow section, measured in the same plane
$e$	mm	Deviation from straightness
$H$	mm	Nominal length of the longer side of a rectangular hollow section
$I$	cm <sup>4</sup>	Second moment of area
$I_t$	cm <sup>4</sup>	Torsional-inertia constant (polar moment of inertia for circular hollow sections only)
$i$	cm	Radius of gyration
$L$	mm	Length
$M$	kg/m	Mass per unit length
$O$	%	Out-of-roundness
$R$	mm	External corner radius of a square or rectangular hollow section
$T$	mm	Nominal thickness
$V$	mm	Total twist
$V_1$	mm	Twist measured at one end of a section
$W_{el}$	cm <sup>3</sup>	Elastic section modulus
$W_{pl}$	cm <sup>3</sup>	Plastic section modulus
$x_1$	mm	Concavity of a side of a square or rectangular hollow section
$x_2$	mm	Convexity of a side of a square or rectangular hollow section
XX	—	Axis of cross-section: major axis of a rectangular hollow section
YY	—	Axis of cross-section: minor axis of a rectangular hollow section
$\theta$	Degrees	Angle between adjacent sides of a square or rectangular hollow section

**5 Information to be supplied by the purchaser**

The following mandatory information taken from this part of ISO 10799 shall be supplied by the purchaser at the time of enquiry and ordering:

- a) the type of length, and the length or the length range (see Table 4);
- b) the dimensions (see Clause 8).

NOTE This information is included in the list of information to be supplied by the purchaser contained in 5.1 of ISO 10799-1:—.

**6 Tolerances**

Tolerances on the dimensions and mass of cold-formed hollow sections shall not exceed the values given in Table 2 for shape and mass, Table 3 for external corner profiles, Table 4 for length and, in the case of submerged-arc-welded hollow sections, Table 5 for the height of the internal and external weld beads.

The internal corners of square and rectangular hollow sections shall be rounded.

NOTE The internal corner profile is not specified.

Table 2 — Tolerances

Characteristic	Circular hollow sections	Square and rectangular hollow sections	
		Side length mm	Tolerance
Outside dimensions ( $D$ , $B$ and $H$ )	$\pm 1\%$ , with a minimum of $\pm 0,5$ mm and a maximum of $\pm 10$ mm.	$H, B < 100$	$\pm 1\%$ , with a minimum of $\pm 0,5$ mm
		$100 \leq H, B \leq 200$	$\pm 0,8\%$
		$H, B > 200$	$\pm 0,6\%$
Thickness, $T$	For $D \leq 406,4$ mm $T \leq 5$ mm: $\pm 10\%$ $T > 5$ mm: $\pm 0,50$ mm For $D > 406,4$ mm $\pm 10\%$ with a maximum of $\pm 2$ mm	$T \leq 5$ mm: $\pm 10\%$  $T > 5$ mm: $\pm 0,50$ mm	
Out-of-roundness, $O$	2 % for hollow sections having a diameter to thickness ratio not exceeding $100^a$	—	
Concavity/convexity <sup>b</sup>	—	Max. 0,8 %, with a minimum of 0,5 mm	
Squareness of sides	—	$90^\circ \pm 1^\circ$	
External corner profile	—	See Table 3	
Twist, $V$	—	2 mm plus 0,5 mm/m length	
Straightness	0,2 % of total length	0,15 % of total length	
Mass, $M$ , per unit length	$\pm 6\%$ on individual lengths		
<sup>a</sup> Where the diameter to thickness ratio exceeds 100, the tolerance on out-of-roundness shall be agreed. <sup>b</sup> The tolerance on convexity and concavity is dependent of the tolerance on outside dimensions.			

Table 3 — External corner profile

Thickness $T$ mm	External corner profile $C_1, C_2$ , or $R^a$ mm
$T \leq 6$	1,6 $T$ to 2,4 $T$
$6 < T \leq 10$	2,0 $T$ to 3,0 $T$
$T > 10$	2,4 $T$ to 3,6 $T$
<sup>a</sup> The sides need not be tangential to the corner arcs.	

Table 4 — Tolerances on length<sup>a</sup>

Type of length	Range mm	Tolerance
Random length	4 000 to 16 000 with a range of 2 000 per order item.	10 % of sections supplied may be below the minimum for the ordered range, but not less than 75 % of the minimum of the range.
Approximate length	≥ 4 000	+50 mm 0
Exact length	< 6 000	+5 mm 0
	≥ 6 000 to ≤ 10 000	+15 mm 0
	> 10 000	+5 mm + 1 mm/m 0

<sup>a</sup> The purchaser shall indicate in the enquiry and order the type of length required and the length or length range as appropriate.

Table 5 — Tolerance on height of internal and external weld bead for submerged-arc-welded hollow sections

Thickness <i>T</i> mm	Maximum weld bead height mm
≤ 14,2	3,5
> 14,2	4,8

## 7 Measurement of size and shape

### 7.1 General

All external dimensions including out-of-roundness shall be measured at a distance from the end of the hollow section of not less than *D* for circular sections, *B* for square sections or *H* for rectangular sections, with a minimum of 100 mm.

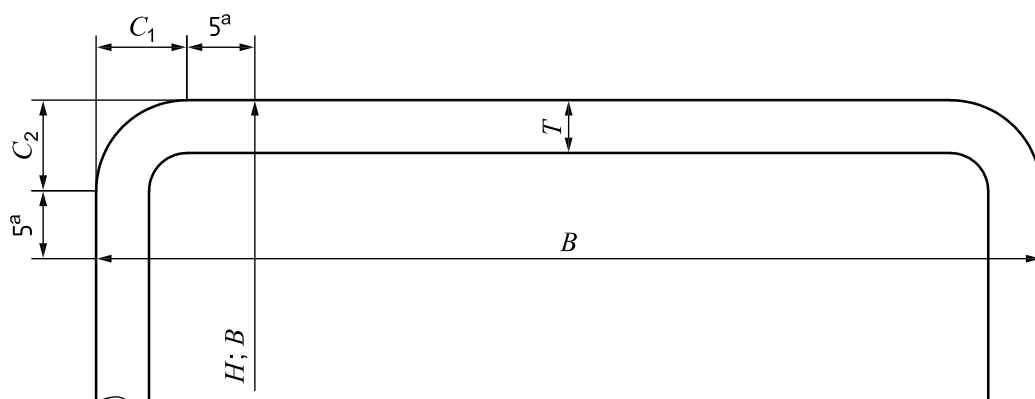
### 7.2 Outside dimension

For circular hollow sections, the diameter, *D*, shall be measured. A calliper gauge, circumference tape or other suitable device may be used at the discretion of the manufacturer.

Dimensions *B* and *H* shall be measured at a position within 5 mm from the start of the external corner profile as shown in Figure 1.



Dimensions in millimetres



<sup>a</sup> This dimension is a maximum when measuring  $B$  or  $H$  and a minimum when measuring  $T$ .

**Figure 1 — Limiting cross-sectional positions for measuring the dimensions  $B$ ,  $H$  and  $T$  for square or rectangular hollow sections**

### 7.3 Thickness

The thickness,  $T$ , shall be measured at a position of not less than  $2T$  from the weld.

The limiting cross-sectional positions for measuring the thickness of square and rectangular hollow sections are shown in Figure 1.

NOTE Thickness is normally measured within a distance of half the outside diameter or half the longer side length from the end of the section.

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### 7.4 Out-of-roundness

The out-of-roundness,  $O$ , of a circular hollow section shall be calculated, as a percentage, from the following equation:

$$O = \frac{D_{\max} - D_{\min}}{D} \times 100$$

### 7.5 Concavity and convexity

The concavity,  $x_1$ , or the convexity,  $x_2$ , of the sides of a square or rectangular hollow section shall be measured as shown in Figure 2.

The percentage concavity or convexity shall be calculated using the following:

$$\frac{x_1}{B} \times 100; \frac{x_2}{B} \times 100; \frac{x_1}{H} \times 100; \frac{x_2}{H} \times 100$$

where  $B$  and  $H$  are the lengths of the sides containing the concavity,  $x_1$ , or the convexity,  $x_2$ .

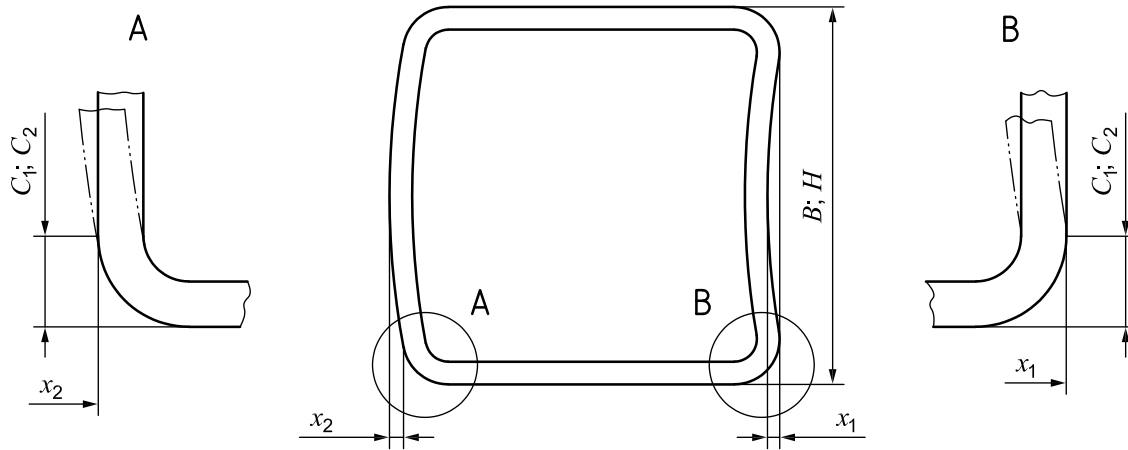
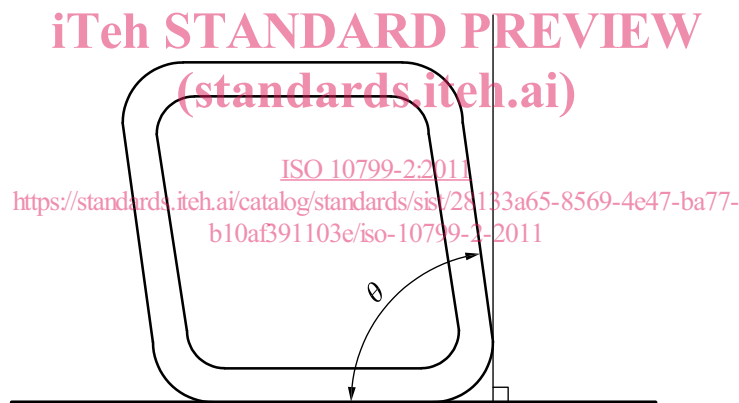


Figure 2 — Measurement of concavity/convexity of square or rectangular hollow sections

7.6 Squareness of sides

The deviation from squareness of the sides of a square or rectangular hollow section is defined as the difference between 90° and  $\theta$  as shown in Figure 3.



Deviation from squareness =  $90^\circ - \theta$

Figure 3 — Squareness of sides of square or rectangular hollow sections

7.7 External corner profile

The external corner profile of a square or rectangular hollow section shall be measured in accordance with a) or b), at the discretion of the manufacturer.

- a) Measure the external corner radius,  $R$ . Use a radius gauge or other suitable device.
- b) Measure the length of the external corner profile ( $C_1$  and  $C_2$  in Figure 4).

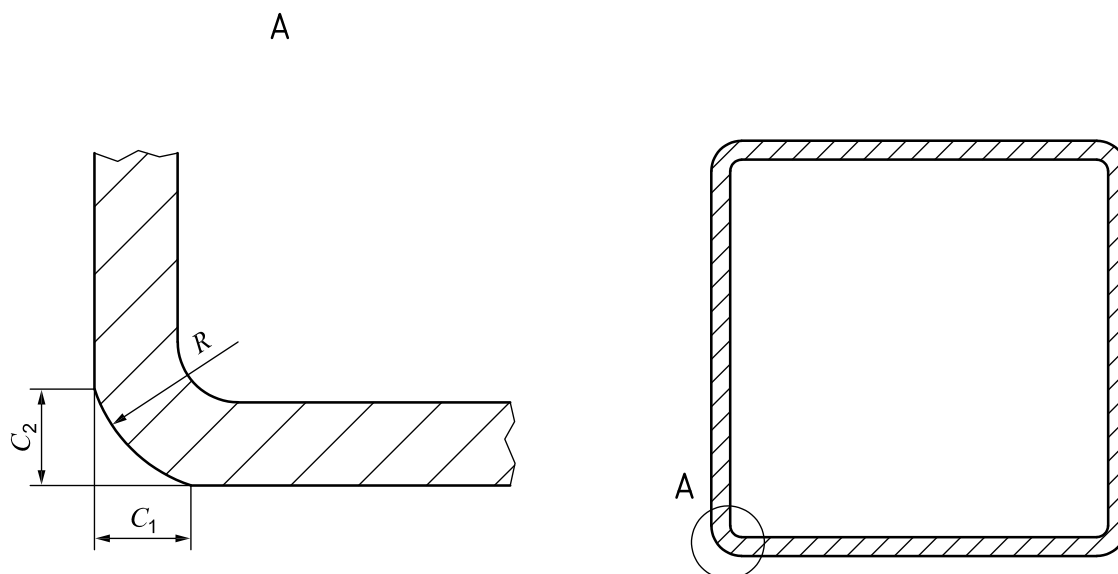


Figure 4 — External corner profile of square or rectangular hollow sections

### 7.8 Twist

The total twist,  $V$ , in a square or rectangular hollow section shall be determined in accordance with a) or b), at the discretion of the manufacturer. (standards.iteh.ai)

- Place the hollow section on a horizontal surface with one side at one end pressed flat against the surface. At the opposite end of the hollow section, determine the difference,  $V$ , in the height of the two lower corners from a horizontal surface (see Figure 5).
- Measure  $V$  with a spirit level and micrometer (screw) gauge or other suitable device. The reference length of the spirit level shall be the distance between the intersection of the flat sides and the external corner profile (see Figure 6).  $V$  is the difference between the values,  $V_1$  (see Figure 6), measured at each end of the section.

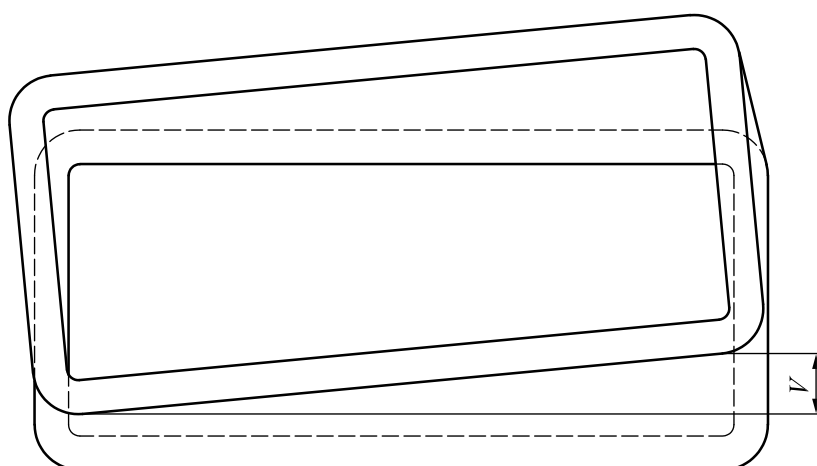
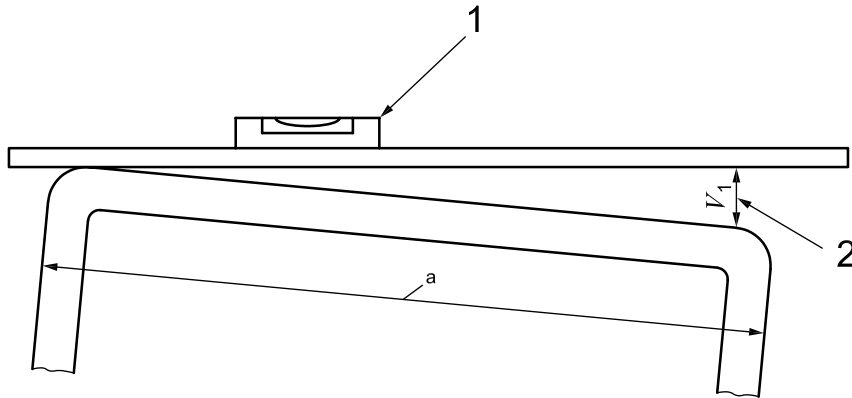


Figure 5 — Total twist of square or rectangular hollow sections



**Key**

- 1 spirit level
- 2 micrometer gauge
- <sup>a</sup> *H* for rectangular sections, *B* for square sections.

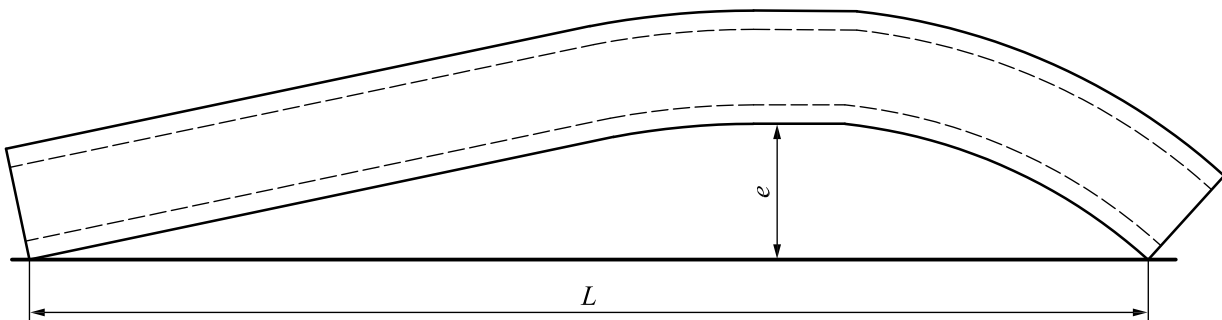
**Figure 6 — Measurement of twist**

**7.9 Straightness**

The deviation from straightness, *e*, of the total length of a hollow section shall be measured at the point of maximum departure of the section from a straight line connecting its two ends as shown in Figure 7. The percentage deviation from straightness shall be calculated using the following:

$$\frac{e}{L} \times 100 \%$$

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**Figure 7 — Measurement of deviation from straightness**

**8 Dimensions and sectional properties**

The nominal section dimensions and sectional properties for a range of cold-formed, structural hollow section sizes are given in Table 6 for circular sections (see Figure 8), Table 7 for square sections and Table 8 for rectangular sections. The sectional properties were calculated from the formulae given in Annex A. Other sizes and thicknesses may be available.