
Through-thickness characteristics for steel products

*Caractéristiques garanties dans le sens de l'épaisseur pour produits
en acier*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 7778:2014](https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014)

[https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-
fb46afcd9881/iso-7778-2014](https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014)



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 7778:2014

<https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Requirements.....	1
4 Designation.....	2
5 Number and selection of test pieces.....	2
5.1 Test unit for flat products.....	2
5.2 Test unit for sections.....	2
5.3 Sampling.....	2
6 Test methods.....	3
6.1 Test pieces.....	3
6.2 Tensile test.....	3
Bibliography.....	7

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 7778:2014](https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014)

<https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014>

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 3, *Steels for structural purposes*.

This second edition cancels and replaces the first edition (ISO 7778:1983), which has been technically revised.

Introduction

Steel products as normally manufactured generally exhibit deformation properties in the direction perpendicular to the surface of the product, which are different from those obtained in the direction of the surface. It is, however, possible to improve these deformation properties by taking particular precautions when the steel is manufactured. Experience has shown that measurement of the value for reduction of area, measured by means of a tensile test piece sampled in the direction of thickness of the product perpendicular to its surface, is the best way to characterize these properties.

However, the choice of one quality of steel exhibiting properties of this nature does not necessarily ensure the safety of a structure of which certain components are stressed perpendicular to their surface. Precautions should be taken both at the design and fabrication stage, and more particularly during welding, so as to minimize stresses in the through-thickness direction.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 7778:2014](https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014)

<https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 7778:2014

<https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-fb46afcd9881/iso-7778-2014>

Through-thickness characteristics for steel products

1 Scope

This International Standard specifies the criteria for through-thickness reduction of area properties specified in the direction of thickness perpendicular to the surface. This International Standard also specifies the test conditions by which conformance to the specified criteria is evaluated.

This International Standard applies to fully killed steel with a specified minimum yield strength or proof strength ≤ 960 MPa and supplied as plates, wide flats, or sections of thickness from 15 mm to 400 mm.

The application of this International Standard to products <15 mm or >400 mm or having minimum specified yield strengths or proof strengths >960 MPa will be the subject of agreement when ordering.

The requirements of this International Standard supplement other International Standards that specify the qualities of products (plate, wide flats, and sections).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

ISO 7778:2014

ISO 404, *Steel and steel products — General technical delivery requirements*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 17577:2006, *Steel — Ultrasonic testing for steel flat products of thickness equal to or greater than 6 mm*

3 Requirements

[Table 1](#) gives the minimum average values and the minimum individual values for the reduction of area, which the products shall satisfy according to their class.

Table 1 — Minimum average and individual values

Class	Minimum average value ^a	Minimum individual value
Z15	15 %	10 %
Z25	25 %	15 %
Z35	35 %	25 %

^a Average of three tests.

NOTE Products delivered in accordance with this International Standard can be subject to ultrasonic testing according to published standards (e.g. ASTM, JIS, EN, ISO, etc.) upon agreement (see, for example, ISO 630-1).

4 Designation

The qualities of steel with specified through-thickness properties shall be marked by adding a plus sign and the class number after the designation of the steel.

EXAMPLE S355D+Z35.

5 Number and selection of test pieces

5.1 Test unit for flat products

See [Table 2](#).

- for sulfur >0,005 %: testing shall be per rolled unit (R) in the same heat treatment condition (parent plate or wide flat);
- for sulfur ≤0,005 %: at the option of the manufacturer, the test unit shall be type 1 or type 2.
 - Type 1 testing: per test unit consisting of products from the same heat (H) which have undergone the same heat treatment and have nominal thicknesses which do not differ by more than 20 % compared with the minimum thickness of the test unit.

Ultrasonic testing in accordance to ISO 17577:2006, Table 4, class B2, is mandatory for all the products of the test unit.

- Type 2 testing: per test unit consisting of products from the same heat which have undergone the same heat treatment and have a total mass of ≤ 40 t (L) and have nominal thicknesses which do not differ by more than 20 % compared with the minimum thickness of the test unit.

ISO 7778:2014
<https://standards.iteh.ai/catalog/standards/sist/5fca4d60-f561-435d-a85e-0b56fd9881/iso-7778-2014>
Table 2 — Test unit

	Sulfur >0,005 %	Sulfur ≤0,005 %	
Frequency	R	Type 1 H	Type 2 L
Ultrasonic testing	-	Mandatory	-

5.2 Test unit for sections

The tests shall be carried out, unless otherwise agreed, per test unit consisting of products from the same heat, which have undergone the same heat treatment, and have a total mass of ≤ 40 t and have nominal thicknesses which do not differ by more than 20 % compared with the minimum thickness of the test unit.

5.3 Sampling

5.3.1 Flat products

For each test unit, three tensile test pieces shall be taken from the thickest product, from one end. In case of continuous cast, the sample shall be taken from the centre of width or nearby or from the 1/4 width or nearby (see [Figure 1](#)). In case of ingot cast, the sample shall be taken from the centre of width or nearby.

5.3.2 Sections

For each test unit, three tensile test pieces shall be taken from the thickest product, from one end. The sampling position shall be the flange unless otherwise agreed at the time of the order. The location of the sample shall be in accordance with ISO 377.

6 Test methods

6.1 Test pieces

6.1.1 The reduction of area shall be measured using a cylindrical test piece. The diameter of the test piece, which depends on the thickness of the product, is given in [Table 3](#).

The effective length, L_c , of the cylindrical part of the test piece shall be $\geq 1,5$ times its diameter.

Table 3 — Diameter of test pieces

Dimensions in millimetres

Product thickness	Diameter of test piece
$t \leq 25$	$d_0 = 6$ or 10
$t > 25$	$d_0 = 10$

6.1.2 When it is not possible to machine a test piece in the thickness of the product, the extension pieces may be attached by welding. Welding may be carried out in accordance with any suitable method (e.g. friction welding), but shall be chosen in a way which results in a minimum heat-affected zone. The effective length, L_c , shall be outside the heat-affected zones.

6.1.3 Unless otherwise agreed when ordering, the manufacturer may use either a test piece with extension pieces attached by welding or a test piece machined in the whole thickness of the product (see [Figure 2](#)). The use of test pieces of type b or c is recommended when it is necessary to examine the surface properties of the product.

6.1.4 For products thicker than 80 mm, when it is not possible to machine a test piece in the whole thickness, the length of the test piece shall be such that the effective length, L_c , contains the 1/4 thickness position of the product (see [Figure 2](#), type d).

NOTE Upon request, an additional test piece can be machined containing the 1/2 thickness position of the product.

6.2 Tensile test

6.2.1 Measurement of reduction of area

The tensile test shall be carried out in accordance with the requirements of ISO 6892-1.

The assessment of results is based on a sequential method (as defined in ISO 404).