

ISO/~~DIS~~FDIS 7217:2022(E)

Date: 2022-~~07-15~~12-09

ISO TC 79/SC 11/WG 5

Secretariat: JISC

Titanium and titanium alloys — Bar, rod and billet — Technical delivery conditions

~~DIS~~ stage

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 7217

<https://standards.iteh.ai/catalog/standards/sist/a8500b17-26dd-423e-aefb-6a38ae3383d4/iso-fdis-7217>

Edited DIS - MUST BE USED FOR FINAL DRAFT

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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

CP 401 • CH-1214 Vernier, Geneva

Phone: + 41 22 749 01 11

Email: copyright@iso.org

Website: www.iso.org

Email: copyright@iso.org

Website: www.iso.org

Published in Switzerland.

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/FDIS 7217

<https://standards.iteh.ai/catalog/standards/sist/a8500b17-26dd-423e-aefb-6a38ae3383d4/iso-fdis-7217>

Contents

Foreword	vi
Introduction	vii
1 — Scope	1
2 — Normative references	1
3 — Terms and definitions	2
4 — Information to be supplied by the purchaser	2
4.1 — General information	2
4.2 — Options	3
5 — Manufacturing	3
6 — Requirements	3
6.1 — General	3
6.2 — Chemical composition	3
Table 1 — Chemical composition <Tbl-->/Tbl-->.....	1
6.3 — Tensile properties	5
Table 2 — Tensile properties at room temperature <Tbl-->/Tbl-->.....	5
6.4 — Dimensional tolerance	6
6.4.1 — General	6
6.4.2 — Tolerance of diameter and width across flats	7
Table 3 — Permissible variation in diameter and width across flats for rounds and squares	7
Table 4 — Permissible variation in width across flats for hexagons and octagons	7
6.4.3 — Tolerance of diameter for rounds with under 8 mm in diameter	7
Table 5 — Permissible variation in diameter for bar and rod with the shape of cross section in rounds under 8 mm in diameter	8
6.4.4 — Tolerance of width and thickness	8
Table 6 — Permissible variation in thickness and width for rectangles (for over 8 mm in width and thickness)	8
6.4.5 — Tolerance of length	8
Table 7 — Permissible variation in length	8
6.4.6 — Straightness	9
6.5 — Surface conditions, imperfections and defects	9
6.5.1 — Non-destructive inspection	9
7 — Inspection	10
7.1 — Types of inspection and inspection documents	10
7.1.1 — General	10
7.1.2 — Inspection documents	10
7.2 — Specific inspection	10
7.2.1 — General	10
7.2.2 — Samples and test pieces for chemical composition and mechanical testing for product analysis	10

8	Rounding-off procedure	11
9	Reference test and analysis	11
10	Rejection	12
11	Marking	12
11.1	General	12
11.2	Products Marking	12
12	Packaging	12
13	Certification	12
	Bibliography	14
	Contents	iii
	Foreword	vi
	Introduction	vii
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Information to be supplied by the purchaser	2
4.1	General information	2
4.2	Options	3
5	Manufacturing	3
6	Requirements	3
6.1	General	3
6.2	Chemical composition	3
	Table 1 — Chemical composition	2
6.3	Tensile properties	5
	Table 2 — Tensile properties at room temperature	5
6.4	Dimensional tolerance	6
6.4.1	General	6
6.4.2	Tolerance of diameter and width across flats	7
	Table 3 — Permissible variation in diameter and width across flats for rounds and squares	7
	Table 4 — Permissible variation in width across flats for hexagons and octagons	7
6.4.3	Tolerance of diameter for rounds with under 8 mm in diameter	7
	Table 5 — Permissible variation in diameter for bar and rod with the shape of cross-section in rounds under 8 mm in diameter	8
6.4.4	Tolerance of width and thickness	8
	Table 6 — Permissible variation in thickness and width for rectangles (for over 8 mm in width and thickness)	8
6.4.5	Tolerance of length	8
	Table 7 — Permissible variation in length	8
6.4.6	Straightness	9
6.5	Surface conditions, imperfections and defects	9
6.5.1	Non-destructive inspection	9

7	Inspection	10
7.1	Types of inspection and inspection documents.....	10
7.2	Specific inspection	10
7.2.1	General.....	10
7.2.2	Samples and test pieces for chemical composition and mechanical testing for product analysis.....	10
8	Rounding-off procedure.....	11
9	Reference test and analysis.....	11
10	Rejection.....	12
11	Marking.....	12
11.1	General.....	12
11.2	Products marking.....	12
12	Packaging.....	12
13	Mill product certificate.....	12
14	Certification.....	13
	Bibliography	14

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 7217

<https://standards.iteh.ai/catalog/standards/sist/a8500b17-26dd-423e-aefb-6a38ae3383d4/iso-fdis-7217>

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 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 11, *Titanium*.

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.

Introduction

This document was developed in response to worldwide demand for stabilizing the quality assurance for titanium and titanium alloys by common regulations worldwide.

Determining condition concerning the technical delivery conditions for bar, rod and billet of titanium and titanium alloys, such as chemical composition, mechanical properties and dimensional tolerance is extremely important to promote commerce of titanium and titanium alloys products in the global market.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning titanium alloys given in Table 1 and Table 2.

ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from the patent database available at www.iso.org/patents.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those in the patent database. ISO shall not be held responsible for identifying any or all such patent rights.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/FDIS 7217](https://standards.iteh.ai/catalog/standards/sist/a8500b17-26dd-423e-aefb-6a38ae3383d4/iso-fdis-7217)

<https://standards.iteh.ai/catalog/standards/sist/a8500b17-26dd-423e-aefb-6a38ae3383d4/iso-fdis-7217>

Titanium and titanium alloys — Bar, rod and billet — Technical delivery conditions

1 Scope

This document specifies requirements for the manufacture and technical delivery conditions of bar, rod and billet made from titanium and titanium alloys.

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-377, *Steel and steel products — Location and preparation of ~~sample sands~~ samples and test pieces for mechanical testing*

ISO 6892-1:20162019, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

~~ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*~~

ISO 10474:2013, *Steel and steel products — Inspection documents*

ISO 11484, *Steel products — ~~Employer's~~ Employer's qualification system for non-destructive testing (NDT) personnel*

ISO 28401, *Light metals and their alloys — Titanium and titanium alloys — Classification and terminology*

ASTM E8/E8M, *Standard Test Methods for Tension Testing of Metallic Materials*

ASTM E29, *Practice for Using Significant Digits in test Data to Determine Conformance with Specifications*

ASTM E539, *Standard Test Method for Analysis of Titanium Alloys by Wavelength Dispersive X-Ray Fluorescence Spectrometry*

ASTM E1409, *Test method for determination of oxygen and nitrogen in titanium and titanium alloys by the inert gas fusion technique*

ASTM E1447, *Test method for determination of hydrogen in titanium and titanium alloys by the inert gas fusion thermal conductivity/ Infrared detection method*

ASTM E1941, *Standard Test method for determination of Carbon in Refractory and Reactive Metals and Their Alloys by Combustion Analysis*

ISO/~~DIS~~-FDIS 7217:2022(E)

ASTM E2371, *Standard Test method for Analysis of Titanium and Titanium alloys by Direct Current Plasma and Inductively Coupled Plasma Atomic Emission Spectrometry (Performance-Based Test Methodology)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 28401 and the following 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/>

Field Code Changed

3.1

bar rod

solid wrought product of uniform cross-section equal to or under 10 000 mm² along its whole length, supplied in straight lengths

Note 1 to entry: ~~The cross-section is equal to or under 10 000 mm square.~~

~~Note 2 to entry:~~ — The cross-section is in the shape of rounds, squares, rectangles or regular polygons like hexagons and octagons.

~~Note 3~~ Note 2 to entry: — Products with a square, rectangular or polygonal cross-section may have corners rounded along their whole length.

3.2

billet

solid wrought product of uniform cross-section above 10 000 mm² along its whole length, supplied in straight lengths

Note 1 to entry: ~~The cross-section is above 10 000 mm square.~~

~~Note 2 to entry:~~ — The cross-section is in the shape of rounds, squares, rectangles or regular polygons like hexagons and octagons.

Note ~~3~~ 2 to entry: — Products with a square, rectangular or polygonal cross-section may have corners rounded along their whole length.

4 Information to be supplied by the purchaser

4.1 General information

The purchase order shall include the following information:

- quantity (e.g. total mass or total length);
- designation;
- dimensions;
- packaging;

- e) inspection;
- f) mill product certificate;
- g) certification: (document issued and/or validated by an independent third party that assures that a product meets specified requirements such as a purchase order).

4.2 Options

A number of options are specified in this document and listed below. In the event that the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the bar, rod or billet shall be supplied in accordance with the basic specification.

- a) restrictive chemistry (see 6.2);
- b) product analysis (see 6.2);
- c) special mechanical properties (see 6.3);
- d) special tolerance (see 6.4);
- e) method of manufacture and finish (see Clause-5 and 6.65).

5 Manufacturing

The bar, rod and billet shall be manufactured by hot-working such as hot-rolling, hot-forging, hot-extrusion of ingot or intermediate product followed by appropriate cold-working, if necessary, as well as surface conditioning and heat treatment. The bar, rod and billet shall be supplied as solid wrought product in straight shapes with uniform cross-section along their whole length.

6 Requirements

6.1 General

When supplied in the delivery condition indicated in 4.1 and inspected in accordance with Clause 7, the bar, rod and billet shall conform to the requirements of this document.

6.2 Chemical composition

The bar, rod and billet of titanium and titanium alloys shall conform to the chemical requirements prescribed in Table 1.

The elements listed in Table 1 are either intentional alloy additions or elements that are inherent to the manufacture of titanium sponge, ingot, or mill product.

The content of any element intentionally added to the formulation of the heat shall be reported.

Other elements are those not specified in the relevant designated material such as Cr and Mo of Ti1-0,18Pd and those not originally specified in the Table 1 such as Co and Hf. Generally, other elements include aluminium, vanadium, tin, molybdenum, chromium, manganese, zirconium, nickel, copper, silicon, cobalt, tungsten, hafnium and yttrium except for alloying elements contained in the designation. The element which is taken as the other element shall be subjected to the agreement between the manufacturer and the purchaser, and shall be noted in the purchase order.