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## Light metals and their alloys— Titanium and titanium alloys— Vocabulary

~~DIS~~ stage

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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 document 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](http://www.iso.org/directives);[www.iso.org/directives](http://www.iso.org/directives)).

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This document was prepared by Technical Committee ISO/TC79, *Light metals and their alloys*, Subcommittee SC 11, *Titanium*.

This second edition cancels and replaces the first edition (ISO 28401:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the title was changed from “Classification and terminology” to “Vocabulary”;
- new terms were added;
- some sentences were revised for clarity;
- the notations alpha and beta were changed from English to Greek;
- some abbreviated terms were removed;
- ~~Annex A~~ **Annex A** was revised and tables were added as additional normative text;
- ~~Annex B~~ was removed.

A list of all parts in the ISO 28401 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](http://www.iso.org/members.html)~~www.iso.org/members.html~~.

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## Introduction

There are many technical terms related to titanium used in national standards.

Unifying and interpreting these technical terms worldwide, so that specifications can be understood accurately around the world, is essential for international trade in common titanium products.

There is a need to classify technical terms related to titanium and establish a common interpretation of each term.

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# Light metals and their alloys — Titanium and titanium alloys — Vocabulary

## 1 Scope

This document defines terms and definitions related to titanium and titanium alloys.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

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 <http://www.electropedia.org/>

### 3.1 Material

#### 3.1.1

##### **titanium sponge**

products of metallic titanium in a porous and sponge-like form, which are applied as titanium metal melting stock

Note 1 to entry: To produce titanium sponge, oxidized titanium ore is chlorinated to tetrachloride and is condensed and purified. Then the product is reduced with magnesium or sodium under an inert atmosphere.

#### 3.1.2

##### **alloy**

metallic substance consisting of a mixture of the basic metallic element and other elements, such as alloying elements and impurities

Note 1 to entry: In this document, the most predominant element by mass fraction is titanium.

#### 3.1.3

##### **alloying element**

metallic or non-metallic elements intentionally added to, or retained by, base metal to give special properties

#### 3.1.4

##### **impurity**

metallic or non-metallic elements which are present but not intentionally added to, or retained by, a metal

#### 3.1.5

##### **wrought alloy**

alloy primarily intended for the production of wrought products by hot and/or cold plastic forming

#### 3.1.6

##### **casting alloy**

alloy primarily intended for the production of castings

### 3.1.7

#### **master alloy**

alloy intended for alloying elements added to molten or compacted titanium by controlling physical properties such as melting point, densities and dissolvability

### 3.1.8:

#### **heat-treatable alloy**

alloy capable of being strengthened by a suitable thermal treatment

### 3.1.9

#### **non-heat-treatable alloy**

alloy capable of being strengthened only by cold working rather than by thermal treatment

## 3.2 Classification of phases and related terms

### 3.2.1

#### **$\alpha$ phase**

solid solution at low temperature with a hexagonal closed packed crystal structure

### 3.2.2

#### **$\alpha$ phase stabilisers**

alloy elements such as aluminium, oxygen, nitrogen and carbon that expand the  $\alpha$  phase, which is the low temperature phase of titanium alloy, to high temperature and enhance the stability of the  $\alpha$  structure

### 3.2.3

#### **$\beta$ phase**

solid solution at high temperature with a body centred cubic crystal structure

### 3.2.4

#### **$\beta$ phase stabilisers**

alloy elements such as iron, manganese, molybdenum and vanadium that expand the  $\beta$  phase, which is the high temperature phase of titanium alloy, to low temperature and enhance the stability of the  $\beta$  structure

### 3.2.5

#### **$\alpha$ plus $\beta$ phase**

mixture of the  $\alpha$  and  $\beta$  phases

### 3.2.6

#### **$\beta$ -transus temperature**

temperature above which the crystal structure turns to the  $\beta$  phase

## 3.3 Classification of microstructure by morphology and related terms

### 3.3.1

#### **microstructure by morphology**

microstructure observed by an optical and/or a scanning microscope characterized by composition, processing and heat treating

Note\_1-to-entry:-See Reference [2] [2] for detailed classifications of titanium and titanium alloy microstructures, including microstructure photographs.

### 3.3.2

#### **equiaxed $\alpha$ structure**

polygonal or globular  $\alpha$  structure with approximately equal dimensions in all directions