NATIONAL STANDARD OF
THE PEOPLE'S REPUBLIC OF CHINA

中华人民共和国国家标准

GB/T 15073—2014

(replacing GB/T 15073—1994)

Casting Titanium and Titanium Alloys

铸造钛及钛合金

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Issued by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China and the Standardization Administration of the People's Republic of China

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1—2009.

This standard replaces GB/T 15073—1994 *Designation and chemical composition of cast titanium and titanium alloys*. Compared with GB/T 15073—1994, the main technical contents have been revised as follows:

- the title of the standard was changed to *Casting Titanium and Titanium Alloys*;

- the chapter titles and the chapter structure were revised;

- table titles were added to each table;

- the composition range of element Al in the ZTC4 alloy was changed from "5.5% to 6.8%" to "5.50% to 6.75%";

- the chemical compositions of the ZTA9, ZTA10, ZTA15 and ZTA17 alloys were added;

- a note on the analysis of specific elements was added;

- a note on arbitration analysis was added;

- the composition ranges and the permissible deviations in Table 2 were revised: ranges for the elements Al, Mo and V were added, and permissible deviations for the elements Zr, Ni and Pd were added.

This standard was proposed and is under the jurisdiction of the National Foundry Standardization Technical Committee (SAC/TC 54).

The responsible drafting organizations of this standard are: Shenyang Research Institute of Foundry, and AVIC Beijing Institute of Aeronautical Materials.

The participating drafting organizations of this standard are: No. 725 Research Institute of China Shipbuilding Industry Corporation, Baoji Titanium Industry Co., Ltd., Guizhou Anji Aviation Precision Casting Co., Ltd., Beijing Xinghang Electromechanical Equipment Co., Ltd., and Wuchang Shipbuilding Industry Group Co., Ltd.

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The previous versions of the standard replaced by this standard are as follows:

- GB/T 15073—1994.

1 Scope

This standard specifies the designations, codes and chemical compositions of cast titanium and titanium alloys, as well as the methods for chemical composition analysis.

This standard applies to titanium and titanium alloys for castings produced with machined graphite molds, rammed molds, metal molds and investment casting molds.

2 Normative References

The following documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition (including all amendments) applies.

Standard No.	Title
GB/T 4698 (all parts)	Methods for chemical analysis of titanium sponge, titanium and titanium alloys
GB/T 8063	Designation system for cast nonferrous metals and their alloys
GB/T 8170	Rules of rounding off for numerical values and expression and judgement of limiting values

3 Designations, Codes and Chemical Compositions

3.1 Designations and Codes

3.1.1 The designation method for cast titanium and titanium alloys shall comply with the provisions of GB/T 8063.

3.1.2 The code of a cast titanium or titanium alloy consists of ZT plus A, B or C (A, B and C denote α-type, β-type and α+β-type alloys respectively) and a sequence number; the sequence number shall follow the designation method for wrought titanium and titanium alloys of the same type.

3.2 Chemical Compositions

3.2.1 The chemical compositions of cast titanium and titanium alloys shall comply with the provisions of Table 1.

Table 1 — Designations and chemical compositions of cast titanium and titanium alloys

Designation	Code	Ti	Al	Sn	Mo	V	Zr	Nb	Ni	Pd	Fe	Si	C	N	H	O	Other elements, max. Individual	Other elements, max. Total
ZTi1	ZTA1	Balance	—	—	—	—	—	—	—	—	0.25	0.10	0.10	0.03	0.015	0.25	0.10	0.40
ZTi2	ZTA2	Balance	—	—	—	—	—	—	—	—	0.30	0.15	0.10	0.05	0.015	0.35	0.10	0.40
ZTi3	ZTA3	Balance	—	—	—	—	—	—	—	—	0.40	0.15	0.10	0.05	0.015	0.40	0.10	0.40
ZTiAl4	ZTA5	Balance	3.3~4.7	—	—	—	—	—	—	—	0.30	0.15	0.10	0.04	0.015	0.20	0.10	0.40
ZTiAl5Sn2.5	ZTA7	Balance	4.0~6.0	2.0~3.0	—	—	—	—	—	—	0.50	0.15	0.10	0.05	0.015	0.20	0.10	0.40
ZTiPd0.2	ZTA9	Balance	—	—	—	—	—	—	—	0.12~0.25	0.25	0.10	0.10	0.05	0.015	0.40	0.10	0.40
ZTiMo0.3Ni0.8	ZTA10	Balance	—	—	0.2~0.4	—	—	—	0.6~0.9	—	0.30	0.10	0.10	0.05	0.015	0.25	0.10	0.40
ZTiAl6Zr2Mo1V1	ZTA15	Balance	5.5~7.0	—	0.5~2.0	0.8~2.5	1.5~2.5	—	—	—	0.30	0.15	0.10	0.05	0.015	0.20	0.10	0.40
ZTiAl4V2	ZTA17	Balance	3.5~4.5	—	—	1.5~3.0	—	—	—	—	0.25	0.15	0.10	0.05	0.015	0.20	0.10	0.40
ZTiMo32	ZTB32	Balance	—	—	30.0~34.0	—	—	—	—	—	0.30	0.15	0.10	0.05	0.015	0.15	0.10	0.40
ZTiAl6V4	ZTC4	Balance	5.50~6.75	—	—	3.5~4.5	—	—	—	—	0.40	0.15	0.10	0.05	0.015	0.25	0.10	0.40
ZTiAl6Sn4.5Zr2Mo1.5	ZTC21	Balance	5.5~6.5	4.0~5.0	1.0~2.0	—	—	1.5~2.0	—	—	0.30	0.15	0.10	0.05	0.015	0.20	0.10	0.40

NOTE 1: "Other elements" refers to trace elements inherently present during the production of cast titanium and titanium alloy castings, generally including Al, V, Sn, Mo, Cr, Mn, Zr, Ni, Cu, Si, Nb, Y, etc. (the alloying elements contained in the relevant designation shall be excluded).

NOTE 2: The individual content and the total content of other elements shall be analyzed only when required by the purchaser.

3.2.2 When the purchaser has special requirements for the impurity contents, this shall be agreed between both parties and stated in the contract or the technical agreement.

4 Chemical Composition Analysis

4.1 Sampling of Test Specimens

Chemical analysis specimens shall be cut from cast test bars or castings; they may also be cut from runners. Chemical analysis specimens shall be clean, free from extraneous impurities and shall not carry cast surface, etc.

4.2 Analysis Methods and Analysis Reports

4.2.1 Chemical composition analysis shall be carried out in accordance with GB/T 4698 (all parts). Subject to agreement between the supplier and the purchaser, other test methods may be used. In case of dispute over the results, arbitration shall be carried out in accordance with GB/T 4698 (all parts).

4.2.2 When the purchaser states in the contract the requirement to provide the contents of specific elements not listed in this standard, the supplier shall carry out chemical composition analysis of such elements and reflect the results in the analysis report.

4.2.3 The number of significant figures of the values in the chemical composition analysis report shall be consistent with that of the corresponding limiting values in Table 1. Rounding off of the analytical values shall be carried out in accordance with GB/T 8170.

4.2.4 When the purchaser carries out re-verification analysis of the chemical composition, the permissible deviations of the composition shall comply with the provisions of Table 2.

4.2.5 If the first inspection of the chemical composition fails, re-sampling and re-analysis shall be permitted; for the re-analysis, double the number of samples shall be taken for testing. If any one of the results of the second analysis fails, the lot shall be deemed non-conforming.

Table 2 — Permissible deviations of each element in chemical composition

Element	Specified composition range/%		Permissible deviation/%
Al		3.3~7.0	±0.40
Sn		2.0~3.0	±0.15
		4.0~5.0	±0.25
Mo		≤1.0	±0.08
		>1.0~2.0	±0.30
		30.0~34.0	±0.40
V		0.8~3.0	±0.15
		3.5~4.5	±0.15
Zr		1.5~2.5	±0.15

Element	Specified composition range/%		Permissible deviation/%
Nb		1.5~2.0	±0.15
Ni		0.6~0.9	±0.05
Pd		0.12~0.25	±0.02
Fe		≤0.25	±0.05
		>0.25~0.40	±0.08
		>0.40~0.50	±0.15
Si		≤0.10	±0.02
		>0.10~0.15	±0.05
C		≤0.10	±0.02
N		≤0.05	±0.02
H		≤0.015	±0.003
O		≤0.20	±0.04
		>0.20~0.25	±0.05
		>0.25~0.40	±0.08
Impurities, other elements	Individual	≤0.10	±0.02
	Total	≤0.40	±0.05