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National Standard of the People’s Republic of China

 GB/T 3620.1-2016

Replace GB/T 3620.1-2007

 Designation and composition of titanium and titanium alloys

**钛及钛合金牌号和化学成分**

*（English Translation） （送审稿）*

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Foreword

SAC/TC 243 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This standard replaces the GB/T 3620.1-2007 *Designation and composition of titanium and titanium alloys*.

This standard compared with GB/T 3620.1-2007 and mainly had the following changes:

—The designation and composition of Industrially unalloyed titanium in GB/T 3620.1-1994 are restored.

—The designations of Industrially unalloyed titanium are changed uniformly, and added with letter "G".

—The designations are listed according to the classification of titanium.

—The editorial errors of designations TA22-1, TA24, TC15 and TC17 are revised.

—The content of Si in TA19 is revised.

—Eight newly registered α and near α alloy designations are added, including TA29, TA30, TA31, TA32, TA33, TA34, TA35 and TA36.

—Six newly registered β and near β alloy designations are added, including TB12, TB13, TB14, TB15, TB16 and TB17.

—Six newly registered α-β alloy designations are added, including TC27, TC28, TC29, TC30, TC31 and TC32.

—The naming rules for titanium alloy designations are added.

—The Implementation requirements on the designation and composition of Industrially unalloyed titanium are specified.

This standard was prepared by SAC/TC 243 National Technical Committee of Standardization for Nonferrous Metals.

The previous editions of this standard are as follows:

—GB/T 3620–1983, GB/T 3620.1–1994 and GB/T 3620.1–2007.

**Designation and composition of titanium and titanium alloys**

# Scope

This standard specifies the designation and composition, etc. of titanium and titanium alloy products.

This standard is applicable to various finished products and semifinished products (including ingot) made of titanium and titanium alloy by metal pressure processing.

# 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.

GB/T 3620.2，*Titanium and titanium alloys — permissible variations of chemical composition for wrought product analysis*

GB/T 4698 (All Parts)，*Methods for chemical analysis of titanium sponge, titanium and titanium alloys*

GB/T 8170，*Rules of rounding off for numerical values & expression and judgment of limiting value*

# Compositions

##  Designations and compositions

**3.1.1** The designations and compositions of titanium and titanium alloy products shall meet the requirements specified in Table1, Table 2 and Table 3, among which Table 1 is for those of Industrially unalloyed titanium, α and near α titanium and titanium alloys; Table 2 is for those of β and near β titanium alloy; Table 3 is for those of α-β titanium alloy.

**3.1.2**  Boron shall be added according to its nominal amount, and the measured data shall be reported for reference.

**3.1.3** When only upper limit is specified for Si in Table1, Table 2 and Table 3, Si shall be controlled as an impurity element.

## Other elements

**3.2.1** Other elements refer to the inherent microelements during production process of titanium and titanium alloys, rather than elements added artificially.

**3.2.2**  Generally, other elements include Al, V, Sn, Mo, Cr, Mn, Zr, Ni, Cu, Si and Y (alloy elements in the designation shall be removed). The content of Y shall not be more than 0.005%. Other special requirements requested by users, if any, shall be agreed upon by both parties, and then noted in the contract.

**3.2.3**  The supplier may not inspect other elements when the products are released from factory, and may conduct sampling inspection if required by the user and noted in the contract.

## Composition tolerance

When the demander takes samples from the products for check analysis on the composition, the composition tolerance shall meet the requirements of GB/T 3620.2.

# Composition Analysis and Analysis Report

**4.1** The arbitrary analysis on composition of titanium and titanium alloy products shall be conducted according to GB/T 4698, while routine inspection may be conducted according to ICP or other approved methods.

**4.2**  Unless otherwise stated in the product standard, the supplier may take samples from titanium and titanium alloy ingot (from finished product in case of hydrogen element) for composition analysis of the product.

**4.3**  The composition of titanium and titanium alloy products is allowed to be subjected to second analysis, the result of which will be regarded as the final judgment basis.

**4.4** The significant digits of the analysis values in the composition analysis report shall be consistent with those of corresponding limit values of corresponding designations in this standard. The numbers after significant digits shall be rounded off according to the rules of GB/T 8170.

# Others

**5.1** See Annex A for the designation and composition of titanium and titanium alloys deleted in the revision of GB/T 3620.1.

 **5.2** See Annex B for the corresponding relationship between Industrially unalloyed titanium and unalloyed titanium designations in ASTM standard system in Table 2.

 **5.3**  See Annex C for the naming rules for designations of titanium and titanium alloy.

 **5.4** See Annex D for all designation and composition of Industrially unalloyed titanium in this standard as well as the implementation description of relevant product standards.

**Table 1 Designation and Composition of Industrially Unalloyed Titanium, α and near α Titanium and Titanium Alloys**

|  |  |  |
| --- | --- | --- |
| Alloy designation | Nominal composition | Composition (mass fraction), % |
| Main composition | Impurity, not more than |
| Ti | Al | Si | V | Mn | Fe | Ni | Cu | Zr | Nb | Mo | Ru | Pd | Sn | Ta | Nd | Fe | C | N | H | O | Other elements |
| Each | Total |
| TA0 | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.15 | 0.10 | 0.03 | 0.015 | 0.15 | 0.1 | 0.4 |
| TA1 | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.25 | 0.10 | 0.03 | 0.015 | 0.20 | 0.1 | 0.4 |
| TA2 | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.10 | 0.05 | 0.015 | 0.25 | 0.1 | 0.4 |
| TA3 | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.40 | 0.10 | 0.05 | 0.015 | 0.30 | 0.1 | 0.4 |
| TA1GELI | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.10 | 0.03 | 0.012 | 0.008 | 0.10 | 0.05 | 0.20 |
| TA1G | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.20 | 0.08 | 0.03 | 0.015 | 0.18 | 0.10 | 0.40 |
| TA1G-1 | Industrially unalloyed titanium | Remainder | ≤0.20 | ≤0.08 | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.15 | 0.05 | 0.03 | 0.003 | 0.12 | — | 0.10 |
| TA2GELI | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.20 | 0.05 | 0.03 | 0.008 | 0.10 | 0.05 | 0.20 |
| TA2G | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.03 | 0.015 | 0.25 | 0.10 | 0.40 |
| TA3GELI | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.25 | 0.05 | 0.04 | 0.008 | 0.18 | 0.05 | 0.20 |
| TA3G | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.35 | 0.10 | 0.40 |
| TA4GELI | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.05 | 0.05 | 0.008 | 0.25 | 0.05 | 0.20 |
| TA4G | Industrially unalloyed titanium | Remainder | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.50 | 0.08 | 0.05 | 0.015 | 0.40 | 0.10 | 0.40 |
| TA5 | Ti-4Al-0.005B | Remainder | 3.3~4.7 | — | — | — | — | — | — | — | — | — | B:0.005 | — | — | — | — | 0.30 | 0.08 | 0.04 | 0.015 | 0.15 | 0.10 | 0.40 |
| TA6 | Ti-5Al | Remainder | 4.0~5.5 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.40 |
| TA7 | Ti-5Al-2.5Sn | Remainder | 4.0~6.0 | — | — | — | — | — | — | — | — | — | — | — | 2.0~3.0 | — | — | 0.50 | 0.08 | 0.05 | 0.015 | 0.20 | 0.10 | 0.40 |
| TA7ELIa | Ti-5Al-2.5SnELI | Remainder | 4.50~5.75 | — | — | — | — | — | — | — | — | — | — | — | 2.0~3.0 | — | — | 0.25 | 0.05 | 0.035 | 0.0125 | 0.12 | 0.05 | 0.30 |
| TA8 | Ti-0.05Pd | Remainder | — | — | — | — | — | — | — | — | — | — | — | 0.04~0.08 | — | — | — | 0.30 | 0.08 | 0.03 | 0.015 | 0.25 | 0.10 | 0.40 |
| TA8-1 | Ti-0.05Pd | Remainder | — | — | — | — | — | — | — | — | — | — | — | 0.04~0.08 | — | — | — | 0.20 | 0.08 | 0.03 | 0.015 | 0.18 | 0.10 | 0.40 |
| TA9 | Ti-0.2Pd | Remainder | — | — | — | — | — | — | — | — | — | — | — | 0.12~0.25 | — | — | — | 0.30 | 0.08 | 0.03 | 0.015 | 0.25 | 0.10 | 0.40 |
| TA9-1 | Ti-0.2Pd | Remainder | — | — | — | — | — | — | — | — | — | — | — | 0.12~0.25 | — | — | — | 0.20 | 0.08 | 0.03 | 0.015 | 0.18 | 0.10 | 0.40 |
| TA10 | Ti-0.3Mo-0.8Ni | Remainder | — | — | — | — | — | 0.6~0.9 | — | — | — | 0.2~0.4 | — | — | — | — | — | 0.30 | 0.08 | 0.03 | 0.015 | 0.25 | 0.10 | 0.40 |
| TA11 | Ti-8Al-1Mo-1V | Remainder | 7.35~8.35 | — | 0.75~1.25 | — | — | — | — | — | — | 0.75~1.25 | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.12 | 0.10 | 0.30 |
| TA12 | Ti-5.5Al-4Sn-2Zr-1Mo-1Nd-0.25Si | Remainder | 4.8~6.0 | 0.2~0.35 | — | — | — | — | — | 1.5~2.5 | — | 0.75~1.25 | — | — | 3.7~4.7 | — | 0.6~1.2 | 0 25 | 0.08 | 0.05 | 0.0125 | 0.15 | 0.10 | 0.40 |
| TA12-1 | Ti-5Al-4Sn-2Zr-1Mo-1Nd-0.25Si | Remainder | 4.5~5.5 | 0.2~0.35 | — | — | — | — | — | 1.5~2.5 | — | 1.0~2.0 | — | — | 3.7~4.7 | — | 0.6~1.2 | 0.25 | 0.08 | 0.04 | 0.0125 | 0.15 | 0.10 | 0.30 |
| TA13 | Ti-2.5Cu | Remainder | — | — | — | — | — | — | 2.0~3.0 | — | — | — | — | — | — | — | — | 0.20 | 0.08 | 0.05 | 0.010 | 0.20 | 0.10 | 0.30 |
| TA14 | Ti-2,3Al-11Sn-5Zr-1Mo-0.2Si | Remainder | 2.0~2.5 | 0.10~0.50 | — | — | — | — | — | 4.0~6 0 | — | 0.8~1.2 | — | — | 10.52~11.50 | — | — | 0.20 | 0.08 | 0.05 | 0.0125 | 0.20 | 0.10 | 0.30 |
| TA15 | Ti-6.5Al-1Mo-1V-2Zr | Remainder | 5.5~7.1 | ≤0.15 | 0.8~2.5 | — | — | — | — | 1.5~2.5 | — | 0.5~2.0 | — | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TA15-1 | Ti-2.5Al-1Mo-1V-1.5Zr | Remainder | 2.0~3.0 | ≤0.10 | 0.5~1.5 | — | — | — | — | 1.0~2.0 | — | 0.5~1.5 | — | — | — | — | — | 0.15 | 0.05 | 0.04 | 0.003 | 0.12 | 0.10 | 0.30 |

**Table 1** (comtinued) **Designation and Composition of Industrial Unalloyed Titanium, α and near α Titanium and Titanium Alloys**

|  |  |  |
| --- | --- | --- |
| Alloy designation | Nominal composition | Composition (mass fraction), % |
| Main composition | Impurity, not more than |
| Ti | Al | Si | V | Mn | Fe | Ni | Cu | Zr | Nb | Mo | Ru | Pd | Sn | Ta | Nd | Fe | C | N | H | O | Other elements |
| Each | Total |
| TA15-2 | Ti-4Al-1Mo-1V-1.5Zr | Remainder | 3.5~4.5 | ≤0.10 | 0.5~1.5 | — | — | — | — | 1.0~2.0 | — | 0.5~1.5 | — | — | — | — | — | 0.15 | 0.05 | 0.04 | 0.003 | 0.12 | 0.10 | 0.30 |
| TA16 | Ti-2Al-2.5Zr | Remainder | 1.8~2.5 | ≤0.12 | — | — | — | — | — | 2.0~3.0 | — | — | — | — | — | — | — | 0.25 | 0.08 | 0.04 | 0.006 | 0.15 | 0.10 | 0.30 |
| TA17 | Ti-4Al-2V | Remainder | 3.5~4.5 | ≤0.15 | 1.5~3.0 | — | — | — | — | — | — | — | — | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TA18 | Ti-3Al-2.5V | Remainder | 2.0~3.5 | — | 1.5~3.0 | — | — | — | — | — | — | — | — | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.015 | 0.12 | 0.10 | 0.30 |
| TA19 | Ti-6Al-2Sn-4Zr-2Mo-0.08Si | Remainder | 5.5~6.5 | 0.06~0.10 | — | — | — | — | — | 3.6~4.4 | — | 1.8~2.2 | — | — | 1.8~2.2 | — | — | 0.25 | 0.05 | 0.05 | 0.0125 | 0.15 | 0.10 | 0.30 |
| TA20 | Ti-4Al-3V-1.5Zr | Remainder | 3.5~4.5 | ≤0.10 | 2.5~3.5 | — | — | — | — | 1.0~2.0 | — | — | — | — | — | — | — | 0.15 | 0.05 | 0.04 | 0.003 | 0.12 | 0.10 | 0.30 |
| TA21 | Ti-1Al-1Mn | Remainder | 0.4~1.5 | ≤0.12 | — | 0.5~1.3 | — | — | — | ≤0.30 | — | — | — | — | — | — | — | 0.30 | 0.10 | 0.05 | 0.012 | 0.15 | 0.10 | 0.30 |
| TA22 | Ti-3Al-Mo-1Ni-1Zr | Remainder | 2.5~3.5 | ≤0.15 | — | — | — | 0.3~1.0 | — | 0.8~2.0 | — | 0.5~1.5 | — | — | — | — | — | 0.20 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TA22-1 | Ti-2.5Al-1Mo-1Ni-1Zr | Remainder | 2.0~3.0 | ≤0.04 | — | — | — | 0.3~0.8 | — | 0.5~1.0 | — | 0.2~0.8 | — | — | — | — | — | 0.20 | 0.10 | 0.04 | 0.008 | 0.10 | 0.10 | 0.30 |
| TA23 | Ti-2.5Al-2Zr-1Fe | Remainder | 2.2~3.0 | ≤0.15 | — | — | 0.8~1.2 | — | — | 1.7~2.3 | — | — | — | — | — | — | — | — | 0.10 | 0.04 | 0.010 | 0.15 | 0.10 | 0.30 |
| TA23-1 | Ti-2.5Al-2Zr-1Fe | Remainder | 2.2~3.0 | ≤0.10 | — | — | 0.8~1.1 | — | — | 1.7~2.3 | — | — | — | — | — | — | — | — | 0.10 | 0.04 | 0.008 | 0.10 | 0.10 | 0.30 |
| TA24 | Ti-3Al-2Mo-2Zr | Remainder | 2.0~3.8 | ≤0.15 | — | — | — | — | — | 1.0~3.0 | — | 1.0~2.5 | — | — | — | — | — | 0.30 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TA24-1 | Ti-3Al-2Mo-2Zr | Remainder | 1.5~2.5 | ≤0.04 | — | — | — | — | — | 1.0~3.0 | — | 1.0~2.0 | — | — | — | — | — | 0.15 | 0.10 | 0.04 | 0.010 | 0.10 | 0.10 | 0.30 |
| TA25 | Ti-3Al-2.5V-0.05Pd | Remainder | 2.5~3.5 | — | 2.0~3.0 | — | — | — | — | — | — | — | — | 0.04~0.08 | — | — | — | 0.25 | 0.08 | 0.03 | 0.015 | 0.15 | 0.10 | 0.40 |
| TA26 | Ti-3Al-2.5V-0.10Ru | Remainder | 2.5~3.5 | — | 2.0~3.0 | — | — | — | — | — | — | — | 0.08~0.14 | — | — | — | — | 0 25 | 0.08 | 0.03 | 0.015 | 0.15 | 0.10 | 0.40 |
| TA27 | Ti-0.10Ru | Remainder | — | — | — | — | — | — | — | — | — | — | 0.08~0.14 | — | — | — | — | 0.30 | 0.08 | 0.03 | 0.015 | 0.25 | 0.10 | 0.40 |
| TA27-1 | Ti-0.10Ru | Remainder | — | — | — | — | — | — | — | — | — | — | 0.08~0.14 | — | — | — | — | 0.20 | 0.08 | 0.03 | 0.015 | 0.18 | 0.10 | 0.40 |
| TA28 | Ti-3Al | Remainder | 2.0~3.0 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.40 |
| TA29 | Ti-5.8Al-4Sn-4Zr-0.7Nb-1.5Ta-0.4Si-0.06C | Remainder | 5.4~6.1 | 0.34~0.45 | — | — | — | — | — | 3.7~4.3 | 0.5~0.9 | — | — | — | S.7~4.3 | 1.3~1 7 | — | 0.05 | 0.04~0.08 | 0.02 | 0.010 | 0.10 | 0.10 | 0.20 |
| TA30 | Ti-5.5Al-3.5Sn-3Zr-1Nb-1Mo-0.3Si | Remainder | 4.7~6.0 | 0.20~0.35 | — | — | — | — | — | 2.4~3.5 | 0.7~1.3 | 0.7~1.3 | — | — | 3.0~3.8 | — | — | 0.15 | 0.10 | 0.04 | 0.012 | 0.15 | 0.10 | 0.30 |
| TA31 | Ti-6Al-3Nb-2Zr-1Mo | Remainder | 5.5~6.5 | ≤0.15 | — | — | — | — | — | 1.5~2.5 | 2.5~3.5 | 0.6~1.5 | — | — | — | — | — | 0.25 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TA32 | Ti-5.5Al-3.5Sn-3Zr-1Mo-0.5Nb-0.7Ta-0.3S i | Remainder | 5.0~6.0 | 0.1~0.5 | — | — | — | — | — | 2.5~3.5 | 0.2~0.7 | 0.3~1.5 | — | — | 3.0~4.0 | 0.2~0 7 | — | 0.25 | 0.10 | 0.05 | 0.012 | 0.15 | 0,10 | 0.30 |
| TA33 | Ti-5.8Al-4Sn-3.5Zr-0.7Mo-0.5Nb-1.1Ta-0.4Si-0.06C | Remainder | 5.2~6.5 | 0.2~0.6 | — | — | — | — | — | 2.5~4.0 | 0.2~0.7 | 0.2~1.0 | — | — | 3.0~4.5 | 0.7~1.5 | — | 0.25 | 0.04~0.08 | 0.05 | 0.012 | 0.15 | 0.10 | 0.30 |
| TA34 | Ti-2Al-3.8Zr-1Mo | Remainder | 1.0~3.0 | — | — | — | — | — | — | 3.0~4.5 | — | 0.5~1.5 | — | — | — | — | — | 0.25 | 0.05 | 0.035 | 0.008 | 0.10 | 0.10 | 0.25 |
| TA35 | Ti-6Al-2Sn-4Zr-2Nb-1Mo-0.2Si | Remainder | 5.8~7.0 | 0.05~0.50 | — | — | — | — | — | 3.5~4.5 | 1.5~2.5 | 0.3~1.3 | — | — | 1.5~2.5 | — | — | 0.20 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TA36 | Ti-1Al-1Fe | Remainder | 0.7~1.3 | — | — | — | 1.0~1.4 | — | — | — | — | — | — | — | — | — | — | — | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| **Note:** The designations of industrially unalloyed titanium of TA0, TA1, TA2 and TA3 are restored in accordance with GB/T 3620.1-1994, the chemical compositions are completely equivalent to those in GB/T 3620.1-1994. |
| **a** The sum of the mass fraction of TA7 ELI impurity "Fe +O" shall not be more than 0.32%. |

**Table 2 Designations and Compositions of β and Near β Titanium Alloys**

|  |  |  |
| --- | --- | --- |
| Alloy designation | Nominal composition  | Composition (mass fraction), % |
| Main composition | Impurity, not more than |
| Ti | Al | Si | V | Cr | Fe | 2r | Nb | Mo | Pd | Sn | Fe | C | N | H | O | Other elements |
| Each | Total |
| TB2 | Ti-5Mo-5V-8Cr-3Ai | Remainder | 2.5~3.5 | — | 4.7~5.7 | 7.5~8.5 | — | — | — | 4.7~5.7 | — | — | 0.30 | 0.05 | 0.04 | 0.015 | 0.15 | 0.10 | 0.40 |
| TB3 | Ti-3.5Al-10Mo-8V-1Fe | Remainder | 2.7~3.7 | — | 7.5~8.5 | — | 0.8~1.2 | — | — | 9.5~11.0 | — | — | — | 0.05 | 0.04 | 0.015 | 0.15 | 0.10 | 0.40 |
| TB4 | Ti-4Al-7Mo-10V-2Fe-1Zr | Remainder | 3.0~4.5 | — | 9.0~10.5 | — | 1.5~2.5 | 0.5~1.5 | — | 6.0~7.8 | — | — | — | 0.05 | 0.04 | 0.015 | 0.20 | 0.10 | 0.40 |
| TB5 | Ti-15V-3Al-3Cr-3Sn | Remainder | 2.5~3.5 | — | 14.0~16.0 | 2.5~3.5 | — | — | — | — | — | 2.5~3.5 | 0.25 | 0.05 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TB6 | Ti-10V-2Fe-3Al | Remainder | 2.6~3.4 | — | 9.0~11.0 | — | 1.6~2.2 | — | — | — | — | — | — | 0.05 | 0 05 | 0.012 5 | 0.13 | 0.10 | 0.30 |
| TB7 | Ti-32Mo | Remainder | — | — | — | — | — | — | — | 30.0~34.0 | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.20 | 0.10 | 0.40 |
| TB8 | Ti-15Mo-3Al-2.7Nb-0.25Si | Remainder | 2.5~3.5 | 0.15~0.25 | — | — | — | — | 2.4~3.2 | 14.0~16.0 | — | — | 0.40 | 0.05 | 0.05 | 0.015 | 0.17 | 0.10 | 0.40 |
| TB9 | Ti-3Al-8V-6Cr-4Mo-4Zr | Remainder | 3.0~4.0 | — | 7.5~8.5 | 5.5~6.5 | — | 3.5~4.5 | — | 3.5~4.5 | ≤0.10 | — | 0.30 | 0.05 | 0.03 | 0.030 | 0.14 | 0.10 | 0.40 |
| TB10 | Ti-5Mo-5V-2Cr-3Al | Remainder | 2.5~3.5 | — | 4.5~5.5 | 1.5~2.5 | — | — | — | 4.5~5.5 | — | — | 0.30 | 0.05 | 0.04 | 0.015 | 0.15 | 0.10 | 0.40 |
| TB11 | Ti-15Mo | Remainder | — | — | — | — | — | — | — | 14.0~16.0 | — | — | 0.10 | 0.10 | 0.05 | 0.015 | 0.20 | 0.10 | 0.40 |
| TB12 | Ti-25V-15Cr-0.3Si | Remainder | — | 0.2~0.5 | 24.0~28.0 | 13.0~17.0 | — | — | — | — | — | — | 0.25 | 0.10 | 0.03 | 0.015 | 0.15 | 0.10 | 0.30 |
| TB13 | Ti-4Al-22V | Remainder | 3 0~4.5 | — | 20.0~23.0 | — | — | — | — | — | — | — | 0.15 | 0.05 | 0.03 | 0.010 | 0.18 | 0.10 | 0.40 |
| TB14a | Ti-45Nb | Remainder | — | ≤0.03 | — | ≤0.02 | — | — | 42.0~47.0 | — | — | — | 0.03 | 0.04 | 0.03 | 0.003 5 | 0.16 | 0.10 | 0.30 |
| TB15 | Ti-4Al-5V-6Cr-5Mo | Remainder | 3.5~4.5 | — | 4.5~5.5 | 5.0~6.5 | — | — | — | 4.5~5.5 | — | — | 0.30 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TB16 | Ti-3Al-5V-6Cr-5Mo | Remainder | 2.5~3.5 | — | 4.5~5.7 | 5.5~6.5 | — | — | — | 4.5~5.7 | — | — | 0.30 | 0.05 | 0.04 | 0.015 | 0.15 | 0.10 | 0.40 |
| TB17 | Ti-6.5Mo-2.5Cr-2V-2Nb-1Sn-1Zr-4Al | Remainder | 3.5~5.5 | ≤0.15 | 1.0~3.0 | 2.0~3.5 | — | 0.5~2.5 | 1.5~3 0 | 5.0~7.5 | — | 0.5~2.5 | 0.15 | 0.08 | 0.05 | 0.015 | 0.13 | 0.10 | 0.40 |
| a The mass fraction of Mg in TB 14 titanium alloy is less than or equal to 0.01%, and that of Mn is less than or equal to 0.01%.  |

 **Table 3 Designations and Compositions of α-β Titanium Alloys**

|  |  |  |
| --- | --- | --- |
| Alloy designation | Nominal composition | Composition (mass fraction), % |
| Main composition | Impurity, not more than |
| Ti | Al | Si | V | Cr | Mn | Fe | Cu | Zr | Nb | Mo | Ru | Pd | Sn | Ta | W | Fe | C | N | H | O | Other elements |
| Each | Total |
| TC1 | Ti-2Al-1.5Mn | Remainder | 1.0~2.5 | — | — | — | 0 7~2.0 | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.012 | 0.15 | 0.10 | 0.40 |
| TC2 | Ti-4Al-1.5Mn | Remainder | 3.5~5.0 | — | — | — | 0.8~2.0 | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.012 | 0.15 | 0.10 | 0.40 |
| TC3 | Ti-5Al-4V | Remainder | 4.5~6.0 | — | 3.5~4.5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.40 |
| TC4 | Ti-6Al-4V | Remainder | 5.50~6.75 | — | 3.5~4.5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.20 | 0.10 | 0.40 |

**Table 3** (comtinued) **Designations and Compositions of α-β Titanium Alloys**

|  |  |  |
| --- | --- | --- |
| Alloy designation | Nominal composition | Composition (mass fraction), % |
| Main composition | Impurity, not more than |
| Ti | Al | Si | V | Cr | Mn | Fe | Cu | Zr | Nb | Mo | Ru | Pd | Sn | Ta | W | Fe | C | N | H | O | Other elements |
| Each | Total |
| TC4ELI | Ti-6Al-4VELI | Remainder | 5.5~6.5 | — | 3.5~4.5 | — | — | — | — | — | — | — | — | — | — | — | — | 0.25 | 0.08 | 0.03 | 0.012 | 0.13 | 0.10 | 0.30 |
| TC6 | Ti-6Al-1.5Cr-2.5Mo-0.5Fe-0.3Si | Remainder | 5.5~7.0 | 0.15~0.40 | — | 0.8~2.3 | — | 0.2~0.7 | — | — | — | 2.0~3.0 | — | — | — | — | — | — | 0.08 | 0.05 | 0.015 | 0.18 | 0.10 | 0.40 |
| TC8 | Ti-6.5Al-3.SMo-0.25Si | Remainder | 5.8~6.8 | 0.20~0.35 | — | — | — | — | — | — | — | 2.8~3.8 | — | — | — | — | — | 0.40 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.40 |
| TC9 | Ti-6.5Al-3.5Mo-2.5Sn-0.3Si | Remainder | 5.8~6.8 | 0.2~0.4 | — | — | — | — | — | — | — | 2.8~3.8 | — | — | 1.8~2.8 | — | — | 0.40 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.40 |
| TC10 | Ti-6Al-6V-2Sn-0.5Cu-0.5Fe | Remainder | 5.5~6.5 | — | 5.5~6.5 | — | — | 0.35~1.00 | 0.35~1.00 | — | — | — | — | — | 1.5~2.5 | — | — | — | 0.08 | 0.04 | 0.015 | 0.20 | 0.10 | 0.40 |
| TC11 | Ti-6.5Al-3.5Mo-1.5Zr-0.3Si | Remainder | 5 8~7.0 | 0.20~0.35 | — | — | — | — | — | 0.8~2.0 | — | 2.8~3.8 | — | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.012 | 0.15 | 0.10 | 0.40 |
| TC12 | Ti-5Al-4Mo-4Cr-2Zr-2Sn-1Nb | Remainder | 4 5~5.5 | — | — | 3.5~4.5 | — | — | — | 1.5~3.0 | 0.5~1.5 | 3.5~4.5 | — | — | 1.5~2.5 | — | — | 0.30 | 0.08 | 0.05 | 0.015 | 0.20 | 0.10 | 0.40 |
| TC15 | Ti-5Al-2.5Fe | Remainder | 4.5~5.5 | — | — | — | — | 2.0~3.0 | — | — | — | — | — | — | — | — | — | — | 0.08 | 0.05 | 0.013 | 0.20 | 0.10 | 0.40 |
| TC16 | Ti-3Al-5Mo-4.5V | Remainder | 2.2~3.8 | ≤0.15 | 4.0~5.0 | — | — | — | — | — | — | 4.5~5.5 | — | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.012 | 0.15 | 0.10 | 0.30 |
| TC17 | Ti-5Al-2Sn-2Zr-4Mo-4Cr | Remainder | 4.5~5.5 | — | — | 3.5~4.5 | — | — | — | 1.5~2.5 | — | 3.5~4.5 | — | — | 1.5~2.5 | — | — | 0.25 | 0.05 | 0.05 | 0.0125 | 0.08~0.13 | 0.10 | 0.30 |
| TC18 | Ti-5Al-4.75Mo-4.75V-1Cr-1Fe | Remainder | 4.4~5.7 | ≤0.15 | 4.0~5.5 | 0.5~1.5 | — | 0.5~1.5 | — | ≤0.30 | — | 4.0~5.5 | — | — | — | — | — | — | 0.08 | 0.05 | 0.015 | 0.18 | 0.10 | 0.30 |
| TC19 | Ti-6Al-2Sn-4Zr-6Mo | Remainder | 5.5~6.5 | — | — | — | — | — | — | 3.5~4.5 | — | 5.5~6.5 | — | — | 1.75~2.25 | — | — | 0.15 | 0.04 | 0.04 | 0.0125 | 0.15 | 0.10 | 0.40 |
| TC20 | Ti-6Al-7Nb | Remainder | 5.5~6.5 | — | — | — | — | — | — | — | 6.5~7.5 | — | — | — | — | ≤0.5 | — | 0.25 | 0.08 | 0.05 | 0.009 | 0.20 | 0.10 | 0.40 |
| TC21 | Ti-6Al-2Mo-2Nb-2Zr-2Sn-1.5Cr | Remainder | 5.2~6.8 | — | — | 0.9~2.0 | — | — | — | 1.6~2.5 | 1.7~2.3 | 2.2~3.3 | — | — | 1.6~2.5 | — | — | 0.15 | 0.08 | 0.05 | 0.015 | 0.15 | 0.10 | 0.40 |
| TC22 | Ti-6Al-4V-0.05Pd | Remainder | 5.50~6.75 | — | 3.5~4.5 | — | — | — | — | — | — | — | — | 0.04~0.08 | — | — | — | 0.40 | 0.08 | 0.05 | 0.015 | 0.20 | 0.10 | 0.40 |
| TC23 | Ti-6Al-4V-0.1Ru | Remainder | 5.50~6.75 | — | 3.5~4.5 | — | — | — | — | — | — | — | 0.08~0.14 | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.015 | 0.13 | 0.10 | 0.40 |
| TC24 | Ti-4.5Al-3V-2Mo-2Fe | Remainder | 4.0~5.0 | — | 2.5~3.5 | — | — | 1.7~2.3 | — | — | — | 1.8~2.2 | — | — | — | — | — | — | 0.05 | 0.05 | 0.010 | 0.15 | 0.10 | 0.40 |
| TC25 | Ti-6.5Al-2Mo-1Zr-1Sn-1W-0.2Si | Remainder | 6.2~7.2 | 0.10~0.25 | — | — | — | — | — | 0.8~2.5 | — | 1.5~2.5 | — | — | 0.8~2.5 | — | 0.5~1.5 | 0.15 | 0.10 | 0.04 | 0.012 | 0.15 | 0.10 | 0.30 |
| TC26 | Ti-13Nb-13Zr | Remainder | — | — | — | — | — | — | — | 12.5~14.0 | 12.5~14.0 | — | — | — | — | — | — | 0.25 | 0.08 | 0.05 | 0.012 | 0.15 | 0.10 | 0.40 |
| TC27 | Ti-5Al-4Mo-6V-2Nb-1Fe | Remainder | 5.0~6.2 | — | 5.5~6.5 | — | — | 0.5~1.5 | — | — | 1.5~2.5 | 3.5~4.5 | — | — | — | — | — | — | 0.05 | 0.05 | 0.015 | 0.13 | 0.10 | 0.30 |
| TC28 | Ti-6.5Al-1Mo-1Fe | Remainder | 5.0~8.0 | — | — | — | — | 0.5~2.0 | — | — | — | 0.2~2.0 | — | — | — | — | — | — | 0.10 | — | 0.015 | 0.15 | 0.10 | 0.40 |
| TC29 | Ti-4.5Al-7Mo-2Fe | Remainder | 3.5~5.5 | ≤0.5 | — | — | — | 0.8~3.0 | — | — | — | 6.0~8.0 | — | — | — | — | — | — | 0.10 | — | 0.015 | 0.15 | 0.10 | 0.40 |
| TC30 | Ti-5Al-3Mo-1V | Remainder | 3.5~6.3 | ≤0.15 | 0.9~1.9 | — | — | — | — | ≤0.30 | — | 2.5~3.8 | — | — | — | — | — | 0.30 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TC31 | Ti-6.5Al-3Sn-3Zr-3Nb-3Mo-1W-0.2Si | Remainder | 6.0~7.2 | 0.1~0.5 | — | — | — | — | — | 2.5~3.2 | 1.0~3.2 | 1.0~3.2 | — | — | 2.5~3.2 | — | 0.3~1.2 | 0.25 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10 | 0.30 |
| TC32 | Ti-5Al-3Mo-3Cr-1Zr-0.15Si | Remainder | 4.5~5.5 | 0.1~0.2 | — | 2.5~3.5 | — | — | — | 0.5~1.5 | — | 2.5~3.5 | — | — | — | — | — | 0.30 | 0.08 | 0.05 | 0.0125 | 0.20 | 0.10 | 0.40 |

# Annex A

# (Informative)

# Designations and Compositions of Titanium Alloys Deleted

 **A.1 See Table A.1 for the designations and compositions of titanium alloys deleted.**

**Table A.1**  **Designations and Compositions of Titanium Alloys Deleted**

|  |  |  |
| --- | --- | --- |
| Alloy designation | Nominal composition | Composition (mass fraction), %  |
| Main composition  | Impurity, not more than |
| Ti | B | Al | Si | Sn | Cr | Fe | Cu | Zr | Mo | Fe | Si | C | N | H | O | Other elements  |
| Each  | Total  |
| TAD | Iodide process titanium | Remainder | — | — | — | — | — | — | — | — | — | 0.03 | — | 0.03 | 0.01 | 0.015 | 0.05 | —  | —  |
| TA8 | Ti-5Al-2.5Sn-3Cu-1.5Zr | Remainder | — | 4.5~5.5 | — | 2.0~3.0 | — | — | 2.5~3.2 | 1.0~1.5 | — | 0.30 | 0.15 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10  | 0.40  |
| TB1 | Ti-3Al-8Mo-11Cr | Remainder | — | 3.0~4.0 | — | — | 10.0~11.5 | — | — | — | 7.0~8.0 | 0.30 | 0.15 | 0.10 | 0.05 | 0.012 | 0.15 | 0.10  | 0.40  |
| TC5 | Ti-5Al-2.5Cr | Remainder | — | 4.0~6.2 | — | — | 2.0~3.0 | — | — | — | — | 0.30 | 0.40 | 0.10 | 0.05 | 0.015 | 0.15 | 0.10  | 0.40  |
| TC7 | Ti-6Al-0.6Cr-0.4Fe-0.4Si-0.01B | Remainder | 0.01 | 5.0~6.5 | 0.25~0.60 | — | 0.4~0.9 | 0.25~0.60 | — | — | — | — | — | 0.10 | 0.05 | 0.015 | 0.18 | 0.10  | 0.40  |
| **Note:**  TB1 and TC5 are the designations deleted when the national standard GB/T 3620.1-1983 was prepared, TA8 and TC7 are the designations deleted when the national standard GB/T 3620.1-1994 was revised, and TAD is the designation deleted when GB/T 3620.1 - 2007 was revised.  |

# Annex B

#  (Informative)

#  Corresponding Relationship between Designations of

# Industrially Unalloyed Titanium in Table 2 of this Standard and the Unalloyed Titanium in ASTM Standard System

 **B.1** For the corresponding relationship between designations of Industrially unalloyed titanium in Table 2 of this standard and the unalloyed titanium in ASTM standard system, see Table B.1.

**Table B.1 Corresponding Relationship between Designations of Industrially Unalloyed Titanium in Table 2 of this Standard and the Designations of Unalloyed Titanium in ASTM Standard System**

|  |  |
| --- | --- |
| This standard  | ASTM standard  |
| TA1G  | Grade 1(UNS Number R50250)  |
| TA2G  | Grade 2(UNS Number R50400)  |
| TA3G  | Grade 3(UNS Number R50550)  |
| TA4G  | Grade 4(UNS Number R50700)  |

#

# Annex C

#  (Normative)

# Naming Rules for Titanium and Titanium Alloy Designations

**C.1 Basic rules for naming of designations**

**C.1.1 Classification**

**C.1.1.1**  The designations of titanium and titanium alloy are classified into three categories, i.e. α, α-β and β.

**C.1.1.2** Titanium and titanium alloy designations are classified according to the result of molybdenum equivalent calculated based on the nominal composition content.

**C.1.2 Naming rules**

**C.1.2.1** Registration system is adopted for the uniform naming of titanium and titanium alloy designations, before which designations shall be registered.

**C.1.2.2** Letters and numbers are used to represent the designations of titanium and titanium alloy.

**C.2 Designation preparation method**

**C.2.1**  The first place of designation is capital letter "T", representing titanium and titanium alloy.

**C.2.2** The second place of designation represents the alloy type by using capital letter A, B and C ,with A representing industrially unalloyed titanium, α and near α alloy, B representing β and near β alloy and C representing α-β alloy.

**C.2.3**  Arabic numbers in designation are sequenced in the natural order of registration.

**C.2.4**  As for ultra-low interstitial alloys with the same designation, add "ELI" after the numbers, and there is no space between numbers and "ELI".

**C.3 Preparation rules for nominal compositions**

**C.3.1**  As for the nominal compositions of titanium alloy designation, only the elements whose range must be controlled are listed.

**C.3.2**  The general principle of define the element content in nominal compositions shall be the arithmetic average value which is in the controlled range.

# Annex D

#  (Informative)

# Statement on Implementation of this Standard and Relevant Standards

**D.1 Statement on implementation of designations TA0, TA1, TA2 and TA3**

TA0, TA1, TA2 and TA3 specified in Table 1 of this standard respectively correspond to the TA0, TA1, TA2 and TA3 designations and compositions in the relevant national standards, national military standards and professional standards about titanium issued before January 1, 2007.

**D.2 Statement on implementation of designations TA1GELI, TA1G, TA1G-1, TA2GELI, TA2G, TA3GELI, TA3G, TA4GELI and TA4G**

TA1GELI, TA1G, TA1G-1, TA2GELI, TA2G, TA3GELI, TA3G, TA4GELI and TA4G specified in Table 1 of this standard respectively correspond to TA1ELI, TA1, TA1-1, TA2ELI, TA2, TA3ELI, TA3, TA4ELI and TA4 in GB/T 2965-2007， GB/T 3621-2007, GB/T 3622-2012, GB/T 3623-2007, GB/T 3624-2010, GB/T 3625-2007, GB/T 12769-2007, GB/T 13810-2007, GB/T 14845-2007, GB/T 16598-2013, GB/T 26057-2010, GB/T 26058-2010, GB/T 26059-2010, GB/T 26723-2011, GJB 2218A-2008, GJB 2505A-2008, YS/T 658-2007, YS/T 750-2011, YS/T 794-2012, YS/T 795-2012 and YS/T 885-2013.

**D.3 Reference standards**

GB/T 2965–2007，*Titanium and Titanium Alloy Bars*

GB/T 3621–2007，Titanium *and Titanium Alloy Plate and Sheet*

GB/T 3622–2012，*Titanium and Titanium Alloy Strip and Foil*

GB/T 3623–2007，*Titanium and Titanium Alloy Wire*

GB/T 3624–2010，*Titanium and Titanium Alloy Seamless Tubes*

GB/T 3625–2007，*Titanium and Titanium Alloy Tube for Condensers and Heat Exchangers*

GB/T 12769–2007，*Titanium-clad Copper Bar*

GB/T 13810–2007，*Wrought Titanium and Titanium Alloy for Surgical Implants*

GB/T 14845–2007，*Titanium Sheet for Plate Heat Exchangers*

GB/T 16598–2013，*Titanium and Titanium Alloy Disc and Ring*

GB/T 26057–2010，*Titanium and Titanium Alloy Welded Tube*

GB/T 26058–2010，*Extruded Tube of Titanium and Titanium Alloys*

GB/T 26059–2010，*Titanium and Titanium Alloy Halftone*

GB/T 26723–2011，*Cold Rolled Titanium Strip Coil*

GJB 2218A–2008，*Specification of Titanium and Titanium Alloy Bars and Forging Stocks for Aircraft*

GJB 2505A–2008，*Specification for Titanium and Titanium Alloy Plates, Sheets and Strips for Aviation*

YS/T 658–2007，*Titanium Strip for Welding Tube and Pipe*

YS/T 750–2011，*Hot Rolled Titanium Coil*

YS/T 794–2012，*Seed Sheet of Titanium*

YS/T 795–2012，*Sheet of Titanium and Titanium Alloy for Golf Head*

YS/T 885–2013，*Titanium and Titanium Alloy Forging Blank*