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# 6Al-4V titanium alloys — Determination of aluminium and vanadium contents — Inductively coupled plasma atomic emission spectrometric method

*6Al-4V alliages de titane — Détermination de la teneur en aluminium et en vanadium — Méthode par spectrométrie d'émission atomique avec plasma à couplage inductif*



**PROOF/ÉPREUVE**

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# Foreword

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This document was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 11, *Titanium*.



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# 6Al-4V titanium alloys — Determination of aluminium and vanadium contents — Inductively coupled plasma atomic emission spectrometric method

## 1 Scope

This document specifies an inductively coupled plasma atomic emission spectrometric method for the determination of the contents (mass fraction) of aluminium and vanadium in 6Al-4V titanium alloys.

This method is applicable to all kinds of 6Al-4V titanium alloys specified in ISO 23515 (designation of titanium alloys) for aluminium in the range from 4,70 % to 7,00 % and vanadium in the range from 3,00 % to 5,00 %.

## 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 648, *Laboratory glassware — Single-volume pipettes*

ISO 1042, *Laboratory glassware — One-mark volumetric flasks*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*



## 3 Terms and definitions



No terms and definitions are listed in this document.

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/

## 4 Principle

A test portion is dissolved with nitric and hydrofluoric acids. After suitable dilution and, if necessary, addition of an internal standard element, the solution is nebulized into an inductively coupled plasma atomic emission spectrometer and the intensity of the emitted light from each element is measured (including, where relevant, the intensity of the internal standard element).

## 5 Reagents

### 5.1 General

During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and only grade 2 water as specified in ISO 3696.

### 5.2 Hydrochloric acid solution, 1+1

Add slowly 500 ml of hydrochloric acid ($\rho_{20}$ 1,16 g/ml to 1,19 g/ml) to 500 ml of water and mix.

### 5.3 Nitric acid solution, 1+1

Add slowly 500 ml of nitric acid ($\rho_{20}$ 1,42 g/ml) to 500 ml of water and mix.

### 5.4 Hydrofluoric acid solution, 1+1

Add, carefully and slowly, 100 ml of hydrofluoric acid ($\rho_{20}$ 1,14 g/ml) to 100 ml of water and mix.

### 5.5 Titanium

High purity titanium [min 99,9 % (mass fraction)], containing less than or equal to 0,005 % (mass fraction) of aluminium and vanadium.

### 5.6 Indium solution, 1 g/l

Weigh 1,000 g of high purity indium [min 99,9 % (mass fraction)]. Transfer it into a 300 ml beaker and add 100 ml of hydrochloric acid (5.2) and 20 ml of nitric acid (5.3). Heat gently to complete dissolution. Cool, transfer the solution quantitatively into a 1 000 ml one-mark volumetric flask, dilute to the mark with water and mix.

### 5.7 Cobalt solution, 1 g/l

Weigh 1,000 g of high purity cobalt [min 99,9 % (mass fraction)]. Transfer it into a 300 ml beaker and add 100 ml of nitric acid (5.3). Heat gently to complete dissolution. Cool, transfer the solution quantitatively into a 1 000 ml one-mark volumetric flask, dilute to the mark with water and mix.



### 5.8 Strontium solution, 1 g/l

Weigh 3,043 g of strontium chloride [$SrCl_2 \cdot 6H_2O$]. Transfer it into a 300 ml beaker. Dissolve with water, transfer the solution quantitatively into a 1 000 ml one-mark volumetric flask, dilute to the mark with water and mix.



### 5.9 Aluminium standard solution, 1 g/l

Weigh 1,000 g of high purity aluminium [min 99,9 % (mass fraction)]. Transfer it into a 300 ml beaker and add 100 ml of hydrochloric acid (5.2) and 20 ml of nitric acid (5.3). Heat gently to complete dissolution. Cool, transfer the solution quantitatively into a 1 000 ml one-mark volumetric flask, dilute to the mark with water and mix.

1 ml of this solution contains 1 mg of aluminium.

### 5.10 Vanadium standard solution, 1 g/l

Weigh 1,000 g of high purity vanadium [min 99,9 % (mass fraction)]. Transfer it into a 300 ml beaker and add 100 ml of hydrochloric acid (5.2) and 20 ml of nitric acid (5.3). Heat gently to complete dissolution. Cool, transfer the solution quantitatively into a 1 000 ml one-mark volumetric flask, dilute to the mark with water and mix.

1 ml of this solution contains 1 mg of vanadium.

## 6 Apparatus

### 6.1 General

The usual laboratory apparatus and, in particular, the following shall be used.

 