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1. SCOPE

This document defines technical requirements for condition of supply 6Al-4V TITANIUM ALLOY INGOT dedicated to the aeronautic industry.

2. SUMMARY OF CHANGES

Revision	Date	Changes
A 00	02 Mars 2011	New specification replacing STMU 10-03 A02 New min for Oxygen, new transus acceptable range
A 01	8 August 2011	Aim in chemistry, new transus formula, transus min max, approval sheet, Width tolerance; sampling
A 02	April 17 th , 2012	Traceability requirement Changed "critical parameter" by "key parameter" New title for §7 "certificate of conformance" Link between certificate and concession request Document retention extended to 50 years Add STMU M01 in §5 for surface and preparation of ingot before delivery §4: the BS3TA12 2009 standard is cancelled and replaced by the EN 3310 (November 2011). Add AMS6931 forgot in the previous issue §6: precisions for the identification and marking ingot requirements to take in consideration UKTMP comments and proposals given to the phone meeting performed in April 17 th , 2012.
A03	June 15 th , 2012	§4: Add the date or issue/version of all the requirements. Add the AIMS 03-18-000 requirement. §5: Add precisions for minimum size for the samples §7: Add the N° of VAR used in the certificate and mention of the issue of manufacturing process documents §8: New post address for UKAD.
A04	November 26 th , 2013	§4: Add the AMS 2380, ASTM B299, AMS T 9047, AMS 2249, EN 2954-002, EN4800-005, EN 2858-1, EN 2858-2, DIN 17851, DIN 17862, WL3.7164 teil1/2/3, BS 2TA 12, BS 3TA 100, EN 10204, STMU M01, STMU QSE, FDVAR and PTC. Change of Beta transus range and beta transus min and max temperature authorized. Add macrostructure requirement and add management system precision. Change version of AMS4928. Add precision for melt condition §5: Add reference at STMU M01. Cancel information about the technic for the crown elimination. §6: Correction of "yy" year of start of production and add precision for marking. §7: Change Title and add EN 10204, additional requirement for certificate of the ingot. Add precision to take in consideration UKTMP comments (Mail UKTMP of November 26 th , 2013) §8: Add reference at STMU QSE §9: Add UKTMP precision for shipment condition §10: Change Ingot requirement for Al content, Carbon content and Iron content. Add precision for the authorized dispersion and for number of digits in chemical content results. §13: Cancel "Drawing of pins" and add mention to STMU M01 for quantity and the machining of pin's. §14: Add Ingot range introduction number
A05	March 18 th , 2015	§4: Change version of AMS4928, AMS 6931 and AIMS 03-20-001. Add AD Pamiers requirements P_STM_T0500L_A and P_STM_T0518L_A. Canceled AIMS 03-18-000, EN 2858-1 DIN 17862, WL3.7164 Teil1/2/3, BS 2TA1. Add precision for Beta transus Calculation §10: Change Al min (AD Pamiers requirement) and O2 min §11: Change Beta Transus calculation (New AD Ancizes Lab calculation)

3. DOCUMENT APPROVAL

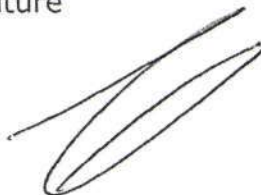
Document preparation by:

Name: Gregory LOLIVE (UKAD Quality)
Date: March 18th, 2015
Signature




Document verified by:

Name: Laurent CLUZEL (UKAD Metallurgy)
Date: March 18th, 2015
Signature



Document approval by:

Name: Marc CABANO (UKAD Quality)
Date: March 18th, 2015
Signature



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4. REQUIREMENTS

Dimensions

- Diameter: 914 mm +/- 10mm
- Weight: 7300 Kg +/- 100 Kg

Process: Ingot elaborated by double VAR melting and in accordance with a grade 1 melting quality process as described in the AMS2380.

Raw materials, melting practice and chemistry according to:

- P_STM_T0500L_A rev A12
- P_STM_T0518L_A rev A03
- AMS 2380 revision F (Reaffirmed 2013)
- ASTM B299 – 2013
- AMS 4928 revision U
- AMS 6931 revision C
- AMS-T-9047 – 05/2003
- AMS 2249 revision G
- IGC 04-40-109 C amendment No. 1 dated 30/06/97
- IGC 04-33-121 issue D
- AIMS 03-20-000 issue 2
- AIMS 03-09-000 issue 3
- AIMS 03-20-001 issue 3
- EN 3310 – 2011
- EN2954-002 – 2010
- EN4800-005 – 11/2010
- EN2858-2 – 08/1994
- DIN 17851 – 11/1990
- BS 3TA 100 - 2009
- FD VAR 00202028-001-12, applicable revision put in the UKAD order
- PTC 00202028-003-11, applicable revision put in the UKAD order
- All the appendices of this STMU
- EN10204 - 2004 for the release certificate and statement of conformity
- STMU M01 , applicable revision put in the UKAD order
- STMU QSE , applicable revision put in the UKAD order

Unless in qualification process, sampling for chemistry from top and bottom at least and in accordance with the pins location's described in the STMU M01

The Management System for Quality, Safety and Environment of the supplier shall be compliant to the STMU QSE.

Quality System of the supplier shall ensure traceability of material and means used for the manufacturing of ingots.

In the event of a conflict, the most stringent requirement takes precedence. If there is a conflict between this UKAD document and the conditions of the purchase order, the purchase order shall take precedence.

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All documents and procedures required by these documents must be available in English at the producer's plant.

Manufacturing process shall be established and sent with a process issue to UKAD for approval. This manufacturing process shall at least define melting process, controls and include key parameters.

In the purpose of receiving material conform to the purchase order and control of introduction ranking, UKAD will not accept material with another process issue. All process change must be submitted to UKAD's quality department to be qualified.

It shall be the supplier's responsibility to positively ensure that the original charge materials are completely free from all foreign matter. In the event that inclusion of any type are detected, all material exhibiting inclusions, or suspected of containing inclusions from that particular heat shall be subject to rejection.

Evidence of melt caused defects found after hot working, forging, hot rolling to hot rolled coil or bar at finished size bar or coil is cause for rejection back to the melt supplier.

The melt conditions shall ensure the capability of the forged product macrostructure:

- Uniform structure of fine or medium grain sizes,
- No imperfections such as pipe, cracks, porosity, laps, folds, pitted areas, segregation and inclusions, detrimental to usage of the forgings.
- In accordance with the EN 2954-002 requirement: finer than the 2MA40 level.

Transus: the beta transus temperature shall be determined by calculation.

The calculation method described in appendix 2 has to be used

Beta transus temperature T_{β} range within an ingot shall not exceed 10°C.

$$985^{\circ}\text{C} \leq T_{\beta} \leq 1010^{\circ}\text{C}$$

The result will be communicated for information only. The true value will be made on forged products. A deviation of beta transus value or range will not generate a concession request.

5. DELIVERY CONDITION

Ingot surface quality must be suitable for forging. See appendix 3 for examples of expected surface.

See STMU M01 for ingot surface preparation before delivery and the number and sampling spots (pin's locations).

Unusual yield loss from forging could be cause for rejection.

Radioactivity: the maximum gamma-radioactivity emitted by the product shall be no more than 0,35 microsievert/hour.

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6. IDENTIFICATION AND MARKING

The identification of the ingot is done on the top of each ingot: heat number, grade and vendor name.

Branding iron or steel impression is required for the heat number:

Heat number marking rule:

yyxxxxK05S

The abbreviations of this ingot code stand for:

yy: year of start of production

xxxx: increasing number

K: Kazakhstan

05: 2-digit grade

S stands for **S**tructure (because the ingot is compliant with the structural parts specification –this one)

For the grade and vendor name markings, the impression can be done on the same face of the heat number marking. Branding iron or steel impression is required.

The complete marking for the ingot identification is:

yyxxxxK05S

Grade 05

UKTMP

7. RELEASE CERTIFICATE WITH STATEMENT OF COMPLIANCE

The certificate of the ingot shall be established in accordance with the EN10204 requirement: release certificate type 3.1 of the EN10204 standard with the inspection results and statement of compliance to the UKAD order.

UKTMP shall provide before each shipment a certificate of conformance including

- UKAD and ARDOR purchase order number
- Material identification by grade
- Heat number
- Reference the EN10204 standard with the version issue
- Reference to the present specification with the version issue
- Reference to the STMU M01 and STMU QSE with the revision issue
- Reference to the FDVAR and PTC with the revision issue
- Delivered weight and dimensions
- Chemical analysis from ingot's top and bottom and for each additional location of the pin's according to STMU M01.
- Beta transus temperature from ingot's top and bottom and for each additional location of the pin's according to STMU M01. It shall be expressed in °C
- The certificate must include a statement that the lot is free of radioactive and mercury contamination
- Melt country of origin and vendor's melt facility
- Date and N°VAR used for the first and second melt.
- The report shall be legible and reproducible in full
- The concession request accepted by UKAD (if any) must be referenced and attached to the certificate.

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8. FILING

See the STMU QSE for the archiving requirement.

Any deviation must be reported before shipment by email to UKAD quality department or by mail to the following address:

UKAD
Département Qualité
RD62 - Lieu dit La Croix de Biolet
63780 Saint Georges de Mons – France

9. SHIPPING INSTRUCTION

Delivery of ingots in maritime railway containers or in trucks on pallets providing side loading to the truck.

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10. Appendix 1

Element	Ingot requirement (weight %)		
	Min	Max	Aim
Aluminum	6,10	6,60	6,35
Vanadium	3,50	4,50	3,95
Iron	-	0,25	0,15
Hydrogen	-	0,0030	-
Oxygen	0,16	0,20	0,18
Carbon	-	0,030	0,020
Nitrogen	-	0,030	-
Copper	-	-	-
Boron	-	-	-
Silicon	-	-	-
Yttrium	-	0,0050	-
Ruthenium	-	-	-
Palladium	-	-	-
Titanium	-	Remainder	-
Other elements each	-	0,10	-
Other elements total	-	0,40	-

Nota: see the AMS 2249 for the authorized dispersion min/max on the ingot in accordance with the range of the different elements.

The chemical content results will be given with same digits after comma as noted in the table of ingot requirements (for example: O₂ max 0.20 => results with two digits after comma and C max 0,030 => results with three digits after comma).

11. Appendix 2

Beta transus calculation using elements % content

$$T_{\beta t} (^{\circ}\text{C}) = 883 + 15,6x\text{Al} - 6,8x\text{V} - 35,2x\text{Fe} + 770x\text{C} + 218x\text{O}_2 + 253x\text{N}_2 - 370x\text{H}_2$$

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12. Appendix 3

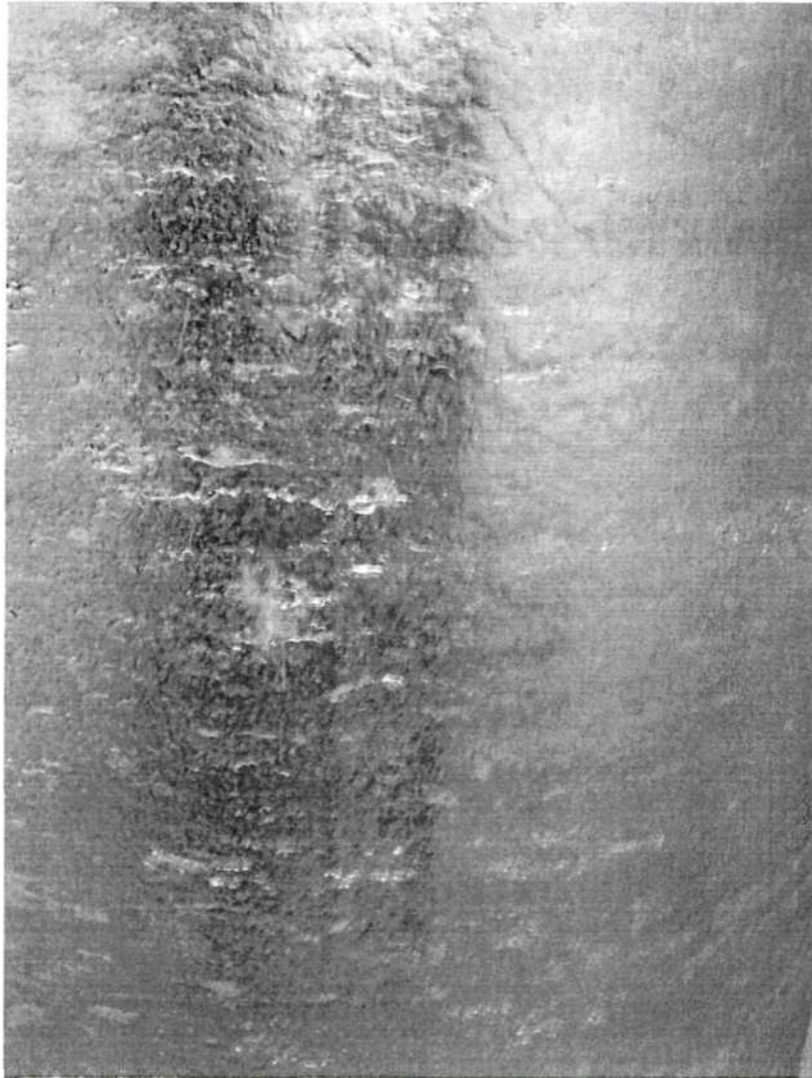


Figure 1 - acceptable surface

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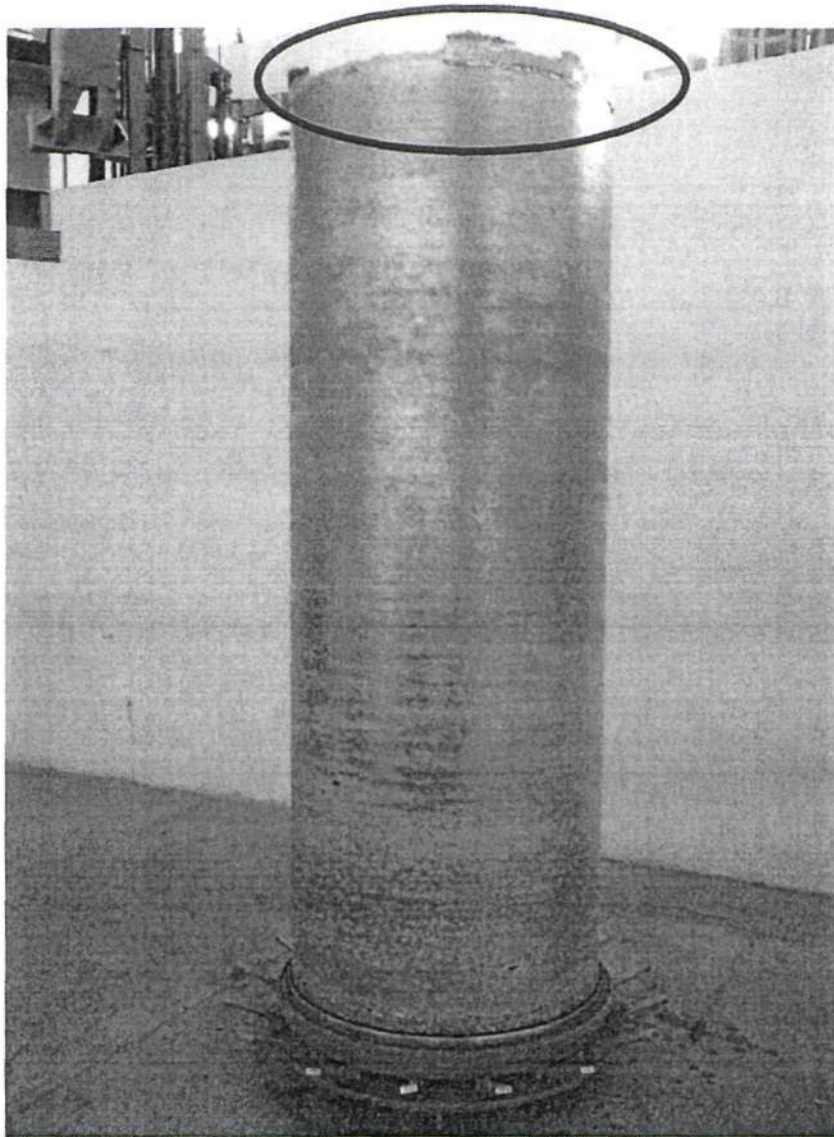


Figure 2 - unacceptable: top with crown (acceptable surface)

13. Appendix 4

See the STMU M01 for the quantity and the machining of pin's.

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14. Appendix 5 – VENDOR APPROVAL

This approval sheet has to be sent back to UKAD's quality with the following filled in for approval of this specification.

This specification has been reviewed and is accepted with no deviation.

The specifications mentioned in this specification have been reviewed and are accepted.

The changes have to be implemented as soon as possible and the introduction range is to be documented by UKTMP: introduction ingot number to be precise just after.

The last revision of this specification will be destroyed or stamped obsolete or for reference only (when applicable).


Ingot range introduction number:

Vendor: UKTMP JSC

Name: B.Zh. Zhenisov

Position: Technical director

Visa and date:


18 MAR 2015