

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	1/9

1. SCOPE

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

2. SUMMARY OF CHANGES

Revision	Date	Changes
A 00	14 December 2010	New specification replacing STMU 10-02 revA02
A 01	8 August 2011	Width tolerance; sampling
A 02	17 April 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: cancelled BSI 2TA12 May 1974 §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 ASTM B348, EN 3310 and AIMS 03-18-000 requirements forgotten in the previous version of the STMU. §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. Appendix 1: add the nickel analyze without aim/mini-maxi required values.
A04	November 26 th , 2013	§4: Add the AMS 2380, ASTM B299, AMS 2249, DI 2111, EN 4800-005, EN 2858-1, EN 2858-2, EN 10204, STMU QSE, STMU M01, FDVAR and PTC. Change of Beta transus range, and add macrostructure requirement. Change version of ASM 4928 and ASTM B348. §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 STMU QSE §9: Add UKTMP precision for shipment condition §10: Add precision for the authorized dispersion and for number of digits in chemical content results. §13: Drawing of pin's cancelled and mention of the STMU M01 §14: Add ingot range introduction number
A05	June 18 th , 2014	§4: Change version of AMS4928, AMS6931, AMS4967 and AIMS 03-20-001. Cancelled AIMS 03-18-000 and EN2858-1.

3. DOCUMENT APPROVAL

Document preparation by:

Name: Gregory LOLIVE (UKAD Quality)

Date: June 18th, 2014

Signature

Gregory LOLIVE

UKAD - Technicien Qualité

UKAD - Quality technician

Par délégation du Responsable Qualité UKAD

By delegation from UKAD Quality Manager

Document verified by:

Name: Laurent CLUZEL (UKAD Metallurgy)

Date: June 18th, 2014

Signature

Document approval by:

Name: Marc CABANO (UKAD Quality)

Date: June 18th, 2014

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Responsable Qualité UKAD

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The diffusion of this document is: **Controlled**

 <p>RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE</p>	<p align="center">SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION</p>	reference	page
		<p align="center">STMU K05F rev A05</p>	<p align="center">2/9</p>

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:

- AMS 2380 revision F (Reaffirmed 2013)
- ASTM B299 - 2013
- AMS 4928 revision U, with the exception of PAM+VAR, which is only acceptable when it is stated as such on the purchase order
- AMS 4967 revision L
- ASTM B348 - 2013
- AMS 6931 revision C
- AMS 2249 revision G
- DI 2111 revision B – 05/02/2009
- IGC 04-40-109 issue 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
- EN4800-005 – 11/2010
- EN2858-2 – 08/1994
- 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.

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	3/9

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.

Transus: the beta transus temperature shall be determined by calculation. Beta transus must be 1785°F (For your information, 974°C) or greater.

Beta transus temperature range shall not exceed 10°C for each ingot.

The calculation method described in appendix 2 has to be used

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.

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	4/9

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:

yyxxxxK05F

The abbreviations of this ingot code stand for:

yy: year of start of production

xxxx: increasing number

K: Kazakhstan

05: 2-digit grade

F stands for **F**asteners (because the ingot is compliant with the fastener specification)

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:

yyxxxxK05F

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 numbers
- 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 required in the STMU M01.
- Beta transus temperature (ingot's top and bottom) and for each additional location of pins, according to STMU M01. It shall be expressed in °C and °F
- 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.

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	5/9

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.

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	6/9

10. Appendix 1

Element	Ingot requirement (Weight %)		
	Min	Max	Aim
Aluminum	5,90	6,30	6,15
Vanadium	3,50	4,50	4,00
Iron	0,13	0,25	0,17
Hydrogen	-	0,0010	-
Oxygen (1)	0,14	0,17	0,16
Carbon	0,007	0,060	0,025
Nitrogen	0,004	0,020	-
Copper	-	0,0500	-
Boron	-	0,0030	-
Nickel (2)	To be analyzed and reported		
Silicon	-	0,050	-
Yttrium	-	0,0050	-
Titanium	-	Remainder	-
Other elements each (2)	-	0,05	-
Other elements total (2)	-	0,20	-

(1) Maximum and minimum should aim to be within 0,01 of average within an ingot

(2) Needs to be reported

Note: see the AMS 2249 for the authorized dispersion min/max on the ingot in accordance with the range of the different elements except for O2 content: see note (1).

The chemical content results will be given with same digits after comma as noted in the table of ingot requirements (for example: O2 max 0.17 => results with two digits after comma and C max 0,060 => results with three digits after comma)

11. Appendix 2

Beta transus calculation: Apply the following factors to the elements %:

Al x 36

V x -24

Fe x -24

C x 1138

O x 514

N x 1293

Add values obtained and add 1568 to get beta-transus in Fahrenheit.

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	7/9

12. Appendix 3



Figure 1 - acceptable surface



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

13. Appendix 4

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

 RD62 – Lieu dit La Croix de Biolet 63780 Saint Georges de Mons FRANCE	SPECIFICATION TECHNIQUE MATIERE INGOT PURCHASE SPECIFICATION	reference	page
		STMU K05F rev A05	9/9

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:

Name:

Position:

Visa and date: