



St. Louis Mill Sales  
 1250 Interstate Drive  
 WENTZVILLE MO. 63385  
 USA  
 Tel:800-753-1550 Fax:636-887-9098  
 Shipping Plant: St. Louis Service Center

Sold-to Address  
 Titanium Metal Supply  
 12215 Kirkham Road, Suite 300  
 POWAY CA 92064  
 USA

### Attachment to Product Certification

Customer P.O. Number/Date  
 16-8718/May 06, 2016  
 TIMET Sales Order Number/Date  
 472892/May 06, 2016  
 TIMET Packing List Number/Scheduled Ship Date  
 80720526/May 13, 2016

Ship-to Address  
 Titanium Metal Supply  
 12215 Kirkham Road, Suite 300  
 POWAY CA 92064  
 USA

TIMET Item #	Material #	Material Description	Quantity	Weight
Customer Item #	Customer Material #	Customer Material #		

000010	125153	TIMETAL® 6-4 Titanium Aero Sheet 3.000PC 136.000LB		
	Specifications	: AMS 4911 * N : AMS-T-9046 * A AB-1 COND A : ASTM B 265 * -15 GRADE 5 : DMS 1592 * H : MIL-T-9046*J AM 2 AB-1 COND A		
	Batch Number	: H24194-Y04		
	Batch Dimensions	: 0.080" X 36.000" X 96.000"		
	Batch Number of Pieces	: 3.000		
	Country of Origin	: USA		
	Heat Number	: H24194		
	Test Number	: S10887		
	B-Additional customer req			
	GEAE S-400 Approved Laboratory			
	GEAE S-1000 Supplier Quality Req'ts			
	DFARS 252.225-7008			

000020	300203	MISC SALES - PACKING BOXES/LUMBER 1.000EA 0.000LB		
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Results are from TIMET Quality Control Records on file. The undersigned has verified that the information on the attached mill product certification meets the requirements of the above referenced order. This Attachment to Product Certification is specific to your referenced order, is an integral part of and amends the physical and chemical test reports attached. All specification(s) and revision(s) that differ from the attached have been approved for inclusion by the producing facility.

Authorized TIMET Signature



107

Date

MAY 13 2016

**BRIAN STALEY**

Quality Assurance Representative



**Titanium Metals Corporation**

**Approved Certificate**

100 Titanium Way  
Toronto, OH, 43964  
Telephone (740) 537-5694, Fax (740) 537-5653

**CERT ID**  
H24194-F01  
08-APR-2016 16:43:36 GMT

**SOLD TO CUSTOMER**  
TIMET Service Center St. Louis  
1250 Interstate Drive, Wentzville, MO 63385

**PURCHASE ORDER** 20128848

**HEAT NUMBER**  
H24194  
**GRADE**  
TIMETAL®6-4

**SHIP TO ADDRESS**  
TIMET Service Center St. Louis  
1250 Interstate Drive, Wentzville, MO 63385

**TEST NUMBER**  
S10887

**PRODUCT DESCRIPTION**  
0.080" SQ Sheet

**DELIVERY CONDITION**  
Annealed

**Specifications**

This material complies with the following specifications:

- AMS 4911 N
- AMS-T-9046 A AB-1 Cond A
- ASTM B 265 -13ae1 Gr. 5
- ASTM F 1472 -14
- BS 2TA59 2009
- BS 7252 PART 3 1997
- DMS 1592 H
- ISO 5832-3 7/1/96
- MIL-T-9046 J AM 2 AB-1 Cond A

<b>Melt Method</b>	<b>Melt/Process Location</b>
3-VAR	TIMET - Henderson, NV, USA / TIMET - Toronto, OH, USA

**Compliance Statements**

1. Surface free from alpha case and product conforms to the other technical requirements of the referenced specification(s).
2. During the manufacturing process, this material has not come in contact with mercury or radioactive luminescent materials; as such, it is certified to be free of mercury and radioactivity.
3. Microstructure examined and acceptable to the order specifications.
4. Bend testing performed meets or exceeds the requirements of the ordered specifications.
5. TIMET-Toronto is an approved supplier of this product per DMS QPL 1592 Issue 19. Ingot melted in accordance with DMS 2442E R-1; TIMET-Henderson, NV, is an approved ingot source per DMS QPL-2442 Issue 20.
6. No weld repair has been performed on this material.
7. Material complies with DFARS 252.225-7008.
8. Material certificate in compliance with EN 10204:2004 Type 3.1.
9. The recording of false, fictitious, or fraudulent statements or entries on this document may be punishable as a felony under Federal Statutes including federal law, Title 18, Chapter 47.
10. TIMET-Toronto has complied with all metal stock producer requirements of AS6279.
11. TIMET-Toronto has a Quality Management System that is in compliance with ISO 9001:2008, and AS 9100:2009 Revision C. (AS9100 certificate is available at www.timet.com)
12. Customer will accept TIMET EXCEPTION to microstructure requirements of BS 7252 PART 3 & ISO 5832-3.

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**Ingot Chemical Analysis**  
(Weight percent)

Unless otherwise noted, Ingot Chemical Analysis performed at Henderson Process Lab, 181 N. Water Street, Henderson, NV, 89015, USA

	Fe	V	Al	C	O	N	Y	BT
<b>Sample ID</b>								
<b>TOP</b>	0.18	4.02	6.30	0.019	0.17	0.009	<0.0004	1831
<b>BOTTOM</b>	0.18	3.99	6.26	0.017	0.18	0.009	<0.0004	1833

**Product Analysis**  
(Weight percent)

Unless otherwise noted, Product Analysis performed at Toronto Laboratory, 100 Titanium Way, Toronto, OH, 43964, USA

	H
<b>Sample ID</b>	
<b>2</b>	71
<b>9</b>	76

**Chemistry Statements**

1. Hydrogen values reported in PPM. Hydrogen determined by inert gas fusion per ASTM E1447. Carbon determined by combustion per ASTM E1941. Oxygen and Nitrogen determined by inert gas fusion per ASTM E1409. Henderson Melt: Metallics determined by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) per ASTM E2371. Morgantown Melt: Copper and Boron by atomic spectrometry (ingot only) and all other elements by x-ray fluorescence spectrometry.
2. Residual elements each less than 0.10% maximum, 0.40% maximum total.
3. Balance titanium.

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**Mechanical Properties**

Unless otherwise noted, testing performed at Toronto Laboratory, 100 Titanium Way, Toronto, OH, 43964, USA

Bend Test, L-Direction, R/T, (ASTM E 290)

BF 4.5

Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

**20X105**

**Sample ID**

**P/F**

2/9

PASS

Bend Test, T-Direction, R/T, (ASTM E 290)

BF 4.5

Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

**20X105**

**Sample ID**

**P/F**

VARIOUS

PASS

Bend Test, T-Direction, R/T, (ASTM E 290)

BF 5.0

Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

**10X180**

**Sample ID**

**P/F**

VARIOUS

PASS

RTT - Longitudinal (ASTM E 8) After Fracture

Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

	0.2YS	U.T.S.	2inEL	EL 5.65A
<b>Sample ID</b>	ksi	ksi	%	%
2	144	153	14	18
9	142	150	18	24

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*First in Titanium Worldwide*



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#### SOLD TO CUSTOMER

TIMET Service Center St. Louis  
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**PURCHASE ORDER** 20128848

RTT - Transverse (ASTM E 8) After Fracture  
Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

	0.2YS	U.T.S.	2inEL	EL 5.65A
<b>Sample ID</b>	ksi	ksi	%	%
2	135	145	14	19
9	136	146	14	20

#### Metallurgical Properties

Unless otherwise noted, testing performed at Toronto Laboratory, 100 Titanium Way, Toronto, OH, 43964, USA

Micro Exam - Transverse  
ETTC4, KROLLS, 100X  
Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

	MT-PRE	MT-OCC	OVERALL
<b>Sample ID</b>	Micr	Micr	P/F
2	P5	-	PASS
9	P5	-	PASS

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**Tests on Other Material**

Unless otherwise noted, testing performed at Toronto Laboratory, 100 Titanium Way, Toronto, OH, 43964, USA

Batch: H24194-F01 (S10087)

Bend Test, T-Direction, R/T, (ASTM E 290)

BF 5.0

Test Condition: Periodic Test: [MILL] Annealed 30 Minutes @ 1400°F, AC + [LAB] Annealed 20 Minutes @ 1325°F, AC

**20X105**

Sample Id	bend
4	PASS

Batch: H24194-F01 (S10087)

RTT - Longitudinal (ASTM E 8) After Fracture

Test Condition: Periodic Test: [MILL] Annealed 30 Minutes @ 1400°F, AC + [LAB] Annealed 20 Minutes @ 1325°F, AC

**0.2YS      U.T.S.      2inEL**

Sample Id	ksi	ksi	%
4	136	144	16

Results are from TIMET Quality Control Records on file  
Sales Order # 445912      Item # 20  
v.1

*Michelle Edwards*



Digitally signed by Michelle Edwards  
DN: c=US, st=OH, f=Toronto, email=Michelle.Edwards@Timet.com, o=Titanium Metals Corporation, cn=Michelle Edwards  
Date: 2016.04.08 12:45:32 -04'00'

Michelle Edwards - Certification Specialist

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