

5884.2.1



Titanium Metals Corporation

Approved Certificate

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

CERT ID
10226DAH01
08-MAY-2014 19:15:27 GMT

PURCHASE ORDER
20107320

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

HEAT NUMBER
10226DA

GRADE
TIMETAL@6-4

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

TEST NUMBER
S8712

PRODUCT DESCRIPTION
0.020" SQ Sheet

DELIVERY CONDITION
Annealed

Specifications

This material complies with the following specifications:

- AMS 4911 M
- AMS-T-9046 A AB-1 Cond A
- ASTM B 265 -13a Gr. 5
- ASTM F 1472 -08e1
- BS 2TA59 2009
- BS 7252 PART 3 1997
- DMS 1592 H
- ISO 5832-3 7/1/96
- MIL-T-9046 I AM 2 AB-1 Cond A

Additional Specifications

- AMS 4911 N
- ASTM B 265 -13ae1 Gr. 5

Melt Method

EB+VAR

Melt/Process Location

TIMET - Morgantown, PA, USA /
TIMET - Toronto, OH, USA

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First in Titanium Worldwide



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Compliance Statements

1. Surface free from alpha case and product conforms to the other technical requirements of the referenced specification(s).
2. Microstructure examined and acceptable to the order specifications.
3. Bend testing performed meets or exceeds the requirements of the ordered specifications.
4. TIMET-Toronto is an approved supplier of this product per DMS QPL 1592 Issue 19. Ingot melted in accordance with DMS 2442; TIMET-Morgantown, PA, is an approved ingot source per DMS QPL-2442 Issue 18.
5. No weld repair has been performed on this material.
6. 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.
7. 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.
8. Material complies with DFARS 252.225-7008.
9. 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)
10. Customer will accept TIMET EXCEPTION to microstructure requirements of BS 7252 PART 3 & ISO 5832-3.

Ingot Chemical Analysis
(Weight percent)

Unless otherwise noted, Ingot Chemical Analysis performed at Morgantown Process Lab, 900 Hemlock Road, Morgantown, PA, 19543, USA

	Fe	V	Al	C	O	N	Y	BT
Sample ID								
TOP	0.16	4.04	6.16	0.024	0.18	0.008	<0.0005	1834
BOTTOM	0.12	3.88	6.13	0.020	0.19	0.006	<0.0005	1838

Product Analysis
(Weight percent)

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

	H
Sample ID	
54	77
55	81
56	89

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: Metallica 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

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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**
54/55/56 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 4.5

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

10X180

Sample ID **P/F**
VARIOUS PASS

RTT - Longitudinal (ASTM E 8)

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

0.2YS U.T.S. 2inEL EL 5.65A

Sample ID	ksi	ksi	%	%
54	142	154	11	14
55	139	151	12	14
56	139	151	13	15

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Page 4 of 6

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RTT - Transverse (ASTM E 8)

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

	0.2YS	U.T.S.	2inEL	EL 5.65A
Sample ID	ksi	ksi	%	%
54	145	156	14	16
55	148	159	12	16
56	145	156	12	18

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Page 5 of 6

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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
Sample ID	Micr	Micr	P/F
54	P12	-	PASS
55	P12	-	PASS
56	P12	-	PASS

Tests on Other Material

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

Batch: H20461-B2S (S8660)

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

BF 4.5

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

20X105

Sample Id	bend
89	PASS

Batch: H20461-B2S (S8660)

RTT - Longitudinal (ASTM E 8)

BF 4.5

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	%
89	136	147	12

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Results are from TIMET Quality Control Records on file
Sales Order # 397084
v.1

Item # 10

Michael Giovannone



Digitally signed by

Michael

Giovannone

Date: 2014.05.08

15:18:55 -04'00'

Michael Giovannone - Certification Specialist

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