

**Titanium Metals Corporation****Approved Certificate**

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

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CERT ID

21193DHB01

27-SEP-2019 17:11:15 GMT

SOLD TO CUSTOMER

PURCHASE ORDER 14461

HEAT NUMBER

21193DH

GRADE

TIMETAL®6-4

SHIP TO ADDRESS**TEST NUMBER**

S17776

PRODUCT DESCRIPTION

0.020" SQ Sheet

DELIVERY CONDITION

Annealed

Specifications

This material complies with the following specifications:

AMS 4911 N

AMS 4911 P

AMS-T-9046 A AB-1 COND A

ASTM F 1472 -14

CMMP015 Rev E

DMS 1592 H

Melt Method

EB+VAR

Melt/Process Location

TIMET - Morgantown, PA, USA /

TIMET - Toronto, OH, USA

Compliance Statements

1. In accordance with MIL-T-9046 J Notice 2 cancellation notice, material is tested and certified to AMS-T-9046 B Table 1 superseding specification AMS 4911 Rev P.
2. In accordance with AMS-T-9046 B cancellation notice, material is tested and certified to Table 1 superseding specification AMS 4911 Rev P.
3. Surface free from alpha case and product conforms to the other technical requirements of the referenced specification(s).
4. Microstructure examined and acceptable to the order specifications.
5. Bend testing performed meets or exceeds the requirements of the ordered specifications.
6. TIMET-Toronto is an approved supplier of this product per DMS QPL 1592 Issue 19. Ingot melted in accordance with DMS 2442E-R1; TIMET-Morgantown, PA, is an approved ingot source per DMS QPL-2442 Issue 20.
7. Laboratory testing complies with General Electric Aircraft Engines S-400 (3-June-16).
8. TIMET-Toronto complies with GE Aviation S-1000 (18-Dec-18).
9. Material complies with DFARS 252.225-7008, DFARS 252.225-7009, and DFARS 252.225-7010.
10. 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.
11. Material has been processed in accordance with the quality system per SABRe 2 revision 1, Approval #10727.
12. TIMET-Toronto has a Quality Management System that is in compliance with ISO 9001:2015, and AS 9100:2016 Revision D. (AS9100 certificate is available at www.timet.com)

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First in Titanium Worldwide

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SOLD TO CUSTOMER**PURCHASE ORDER** 14461**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
Sample ID							
TOP	0.18	4.02	6.63	0.027	0.18	0.005	<0.0005
BOTTOM	0.16	3.98	6.35	0.024	0.18	0.007	<0.0005

Product Analysis
(Weight percent)

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

	H
Sample ID	
45	111
50	105

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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SOLD TO CUSTOMER**PURCHASE ORDER** 14461**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**

45/50

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) After Fracture

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

0.2YS**U.T.S.****2InEL****Sample ID****ksi****ksi****%**

45

136

145

12

50

139

149

11

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SOLD TO CUSTOMER**PURCHASE ORDER 14461**

RTT - Transverse (ASTM E 8) After Fracture

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

0.2YS

U.T.S.

2inEL

Sample ID	ksi	ksi	%
45	142	152	11
50	142	152	12

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**OVERALL**

Sample ID	Micr	P/F
45	P4	PASS
50	P4	PASS

Results are from TIMET Quality Control Records on file
Sales Order # 572741 Item # 10

v.1

Michael Giovannone**Michael Giovannone**

2019.09.27 13:11:53

-04'00'

Michael Giovannone - Certification Specialist

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