

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

100 Titanium Way

Toronto, OH, 43964

Telephone (740) 537-5694, Fax (740) 537-5653

Page 1 of 5

**CERT ID**

21722DHD01

05-SEP-2019 18:57:49 GMT

**PURCHASE ORDER** 14462**HEAT NUMBER** ✓

21722DH

**GRADE** ✓

TIMETAL®6-4

**SHIP TO ADDRESS**

Supra Alloys

352 Balboa Circle, Camarillo, CA 93012

**TEST NUMBER**

S17766

**PRODUCT DESCRIPTION** ✓

0.025" 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

ASME SB 265-17 GRADE 5

ASTM B 265-15 GRADE 5

ASTM F 1472-14

CMMP015 Rev E

DMS 1592 H

MIL-T-9046 J AM 2 AB-1 COND A

Supra Alloys

PO#: 14462

Tag#: 59692

Approved By: EH

**Melt Method**

EB+VAR

**Melt/Process Location**

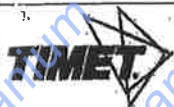
TIMET - Morgantown, PA, USA /

TIMET - Toronto, OH, USA

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First in Titanium Worldwide

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**PURCHASE ORDER 14462****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 complied with all metal stock producer requirements of AS6279 A.
13. 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](http://www.timet.com))

**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
<b>Sample ID</b>							
<b>TOP</b>	0.12	3.75	6.12	0.024	0.18	0.005	<0.0005
<b>BOTTOM</b>	0.12	3.80	6.10	0.024	0.20	0.006	<0.0005

**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>37</b>	87
<b>42</b>	67

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**PURCHASE ORDER** 14462

**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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**PURCHASE ORDER 14462****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**

37/42

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****%**

37

138

148

12

42

139

148

12

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## CERT ID

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**PURCHASE ORDER 14462**

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	%
37	140	149	12
42	138	147	12

Results are from TIMET Quality Control Records on file  
Sales Order # 572742 Item # 10  
v.1

Digitally signed by Michelle  
Edwards  
DN: c=US, st=OH, l=Toronto,  
o=Titanium Metals Corporation,  
ou=Michelle Edwards,  
email=Michelle.Edwards@timet.  
com  
Date: 2019.09.05 14:59:28  
-04'00'

Michelle Edwards - Certification Specialist

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