

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

14461 PURCHASE ORDER

HEAT NUMBER 21193DH

GRADE TIMETAL®6-4 SHIP TO ADDRESS

TEST NUMBER

S17776

PRODUCT DESCRIPTION 0.020" SQ Sheet

> DELIVERY CONDITION TWS Titanium NS Titanium Sample

Annealed

#### Specifications

This material complies with the following specifications:

AMS 4911 N

AMS 4911 P

AB-1 COND AMS-T-9046 A

ASTM F 1472-14 CMMP015 Rev E DMS 1592 H

Melt Method

Melt/Process Location

EB+VAR

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

#### Compliance Statements

- Jum Sample Cert TIMS In accordance with MIL-T-9046 J Notice 2 cancellation notice, material is tested and certified to AMS-T-9046 B Table I superseding specification AMS 4911 Rev P.
- In accordance with AMS-T-9046 B cancellation notice, material is tested and certified to Table 1 superseding specification AMS 4911 Rev P.
- Surface free from alpha case and product conforms to the other technical requirements of the referenced specification(s)
- Microstructure examined and acceptable to the order specifications.
- Bend testing performed meets or exceeds the requirements of the ordered specifications.
- 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.
- Laboratory testing complies with General Electric Aircraft Engines S-400 (3-June-16).
- TIMET Toronto complies with GE Aviation S-1000 (18-Dec-18).
- Material complies with DFARS 252.225-7008, DFARS 252.225-7009, and DFARS 252.225-7010.
- 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.
- 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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## Ingot Chemical Analysis (Weight percent)

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

(a)	Fe	v	AL	c p	0	N	Y
Sample ID TOP BOTTOM	0.18 0.16	4.02	6.63 6.35	0.027 0.024	0.18	0.005 0.007	<0.0005 <0.0005

Product Analysis (Weight percent)

Unless otherwise noted, Product Analysis performed at Foronto Laboratory, 100 Titanium Way, Toronto, OH, 43964, USA ample Cert anium Sam

Sample ID

45

**50** 

- 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. Sample Cert Morgantown Melt: Copper and Boron by atomic spectrometry (ingot only) and all other elements by x-ray fluorescence TNS Titanium Sample Cert TMS Cert TMS
- Residual elements each less than 0.10% maximum, 0.40% maximum total. Sample Cert TMS Titamil
- Balance titanium kanium Sample Cert

Cert This Titanium Sample STitanium Sample Cert This lest report shall not be reproduced except in full, without the written approval of TIMET. itanium Sample The intentional recording of false, fictitious, or fraudulent statements or entries on the certificate may be punished as a felony under federal law.

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Sample SOLD TO CUSTOMER

Mechanical Properties

Unless otherwise noted, testing performed at Toronto Laboratory, 100 Titanium Way, Toronto, OH, 43964, USA Sample Cert TMS Titanium Sample Cert AC AC ACTUAL SAME CENT um Sample Cert This thanium Sample Cert This than the sample Cert This than th

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

**BF 4.5** 

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

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-	Test Condition: [MILL]	mnealed 30 Minutes @ 1	400°H, AC	(Ox. 10)			
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RTT - Transverse (ASTM E 8) After Fracture

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

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Sample ID	Ø ksi	ksi	S %
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50	142	152	12

## Metallurgical Properties

Sample Cert TMS minn Sample Cert TMS sample cert MS Titanium Sami 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		
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50	P4	PASS	- MY	11
Results are from TIMET ( Sales Order # 572741  v.1	Quality Control 1	Records on file	50	-0/
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De Cert 2019.09.27 13:11:53 Michael Giovannone Titanium Sample Cert TMS Titanium Sam

Titanium Sample Cert

Michael Giovannone - Certification Specialist

Cert TMS Titanium Same Michae Michae Sannole -cert TIMS Sample Cert This This less report shall not be reproduced except in full, without the written approval of TIMET. Sanple Sanple The intentional recording of false, fictitious, or fraudulent statements or entries on the certificate may be punished as a felony under federal law.

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