5879.5.2

TIMET

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

Approved Certificate

CERT ID
09216DDF01
19-MAR-2013 20:08:34 GMT

PURCHASE ORDER
20088058

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

HEAT NUMBER
09216DD

GRADE
TIMETAL®6-4

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

TEST NUMBER
S7593

PRODUCT DESCRIPTION
0.070" SQ Sheet

DELIVERY CONDITION
Annealed

Specifications
This material complies with the following specifications:
AMS 4911 M
AMS-T-9046 A AB-1 COND A
DMS 1592 G

Additional Specifications
DMS 1592 H

Melt Method
EB+VAR

Melt/Process Location
TIMET - Morgantown, PA, 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. 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 18. Ingot melted in accordance with DMS 2442; TIMET-Morgantown, PA, is an approved ingot source per DMS QPL-2442 Issue 18.
5. TIMET-Toronto has a Quality Management System that is in compliance with ISO 9001:2008, and AS 9100:2009 Revision C, Certificate No. UQA 0113328, through Lloyd's Register Quality Assurance, effective 24-Jul-03.

Accredited Nadcap Materials Testing Laboratory Nondestructive Testing Heat Treating
REGISTERED ISO 9001/AS9100 FACILITY

This test report shall not be reproduced except in full, without the written approval of TIMET.

The intentional recording of false, fictitious, or fraudulent statements or entries on the certificate may be punished as a felony under federal law

First in Titanium Worldwide

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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

Sample ID	Fe	V	Al	C	O	N	Y
TOP	0.17	4.06	6.33	0.014	0.18	0.006	<0.0005
BOTTOM	0.14	3.92	6.57	0.012	0.19	0.007	<0.0005

Product Analysis
(Weight percent)

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

Sample ID	H
14	38
18	33

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.

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

Sample ID	20X105 P/F
14/18	PASS

Accredited Nadcap Materials Testing Laboratory, Nondestructive Testing, Heat Treating
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109 Interstate Drive, Wentzville, MO 63385

Bend Test, T-Direction, R/T, (ASTM E 290)
BF 4.5
Test Condition: [MILL] Annealed 30 Minutes @ 1400°F, AC

Sample ID	**20X105**
	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

Sample ID	**10X180**
	P/F
VARIOUS	PASS

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

Sample ID	**0.2YS**	**U.T.S.**	**2inEL**
	ksi	**ksi**	**%**
14	139	150	14
18	140	151	13

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

Sample ID	**0.2YS**	**U.T.S.**	**2inEL**
	ksi	**ksi**	**%**
14	142	151	13
18	145	154	12

Accredited Nadcap Materials Testing Laboratory (Nondestructive Testing, Heat Treating)
REGISTERED ISO 9001/AS9100 FACILITY

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Tests on Other Material

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

Batch: 09604DDD01 (S7579)
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

Sample ID	20X105 bend
34	PASS

Batch: 09604DDD01 (S7579)
RTT - Longitudinal (ASTM E 8)
Test Condition: Periodic Test: [MILL] Annealed 30 Minutes @ 1400°F, AC + [LAB] Annealed 20 Minutes @ 1325°F, AC

Sample ID	0.2YS ksi	U.T.S. ksi	2inEL %
34	138	146	15

Results are from TIMET Quality Control Records on file
Sales Order # 356229 Item # 10
v.1

Pete Colantoni - Certification Specialist

Nadcap Accredited Materials Testing Laboratory, Nondestructive Testing, Heat Treating
REGISTERED ISO 9001/AS9100 FACILITY

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First in Titanium Worldwide

5845

Attachment to Product Certification

Repeat Printout

Customer P.O. Number/Date
5879 (.070")/Feb 26, 2015

TIMET Sales Order Number/Date
434890/Feb 27, 2015

TIMET Packing List Number/Scheduled Ship Date
80657414/Mar 06, 2015

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

Sold-to Address

Ship-to Address

TIMET Item # / Customer Item #	Material # / Customer Material #	Material Description	Quantity	Weight	
000010	120405	*TIMETAL*® 6-4 Titanium Aero Sheet			
Specifications		: AMS 4911 * N			
Batch Number		: 09470DCY12	26.000LB	26.000LB	5.1
Batch Dimensions		: 0.070" X 16.000" X 145.187"			
Batch Number of Pieces		: 1.000			
Country of Origin		: USA			
Heat Number		: 09470DC			
Test Number		: S7602			
Batch Number		: 09216DDY09	739.000LB	739.000LB	5.2
Batch Dimensions		: 0.070" X 16.000" X 192.000"			
Batch Number of Pieces		: 21.000			
Country of Origin		: USA			
Heat Number		: 09216DD			
Test Number		: S7593			
Batch Number		: 09470DCY11	243.000LB	243.000LB	5.3
Batch Dimensions		: 0.070" X 16.000" X 192.000"			
Batch Number of Pieces		: 7.000			
Country of Origin		: USA			
Heat Number		: 09470DC			
Test Number		: S7602			
Batch Number		: 09216DDY10	176.000LB	176.000LB	5.4
Batch Dimensions		: 0.070" X 16.000" X 192.000"			
Batch Number of Pieces		: 5.000			
Country of Origin		: USA			
Heat Number		: 09216DD			
Test Number		: S7588			

TMS Titanium Sample Cert

Attachment to Product Certification

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434890/Feb 27, 2015

TIMET Packing List Number/Scheduled Ship Date
80657414/Mar 06, 2015

St. Louis Mill Sales
109 Interstate Drive
WENTZVILLE MO 63385
USA
Tel:800-753-1550 Fax:636-887-3098
Shipping Plant: St. Louis Service Center

Sold-to Address

Ship-to Address

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

B-Additional customer req
Sold as SMI
Short cycle waves - within spec

5 pcs @ .070x16x192 - 09216DDY05
21 pcs @ .070x16x192 - 09216DDY08
1 pc @ .070x16x145.19 - 09470DCY09
7 pcs @ .070x16x192 - 09470DCY07

Condition of material - As per TIMET's offer attached

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 _____ Date MAR 05 2015

BRIAN STALEY
Quality Assurance Representative

TMS Titanium Sample Cert