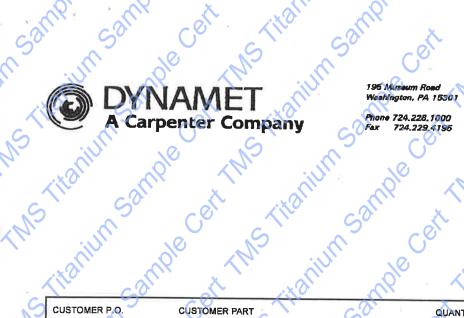


### PRODUCT CERTIFICATION

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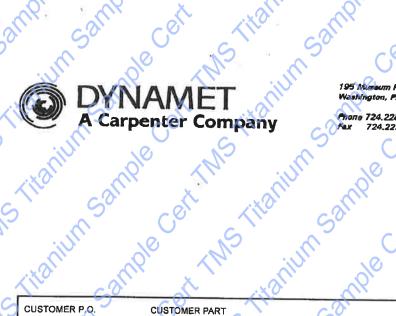
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(C) PINA	MET er Company	Phone 724.22	WOR	K ORDER	SALES ORDER / RL	
A Carpent	er Company		9.4195	519826	065755 / 00	
itanium Sample	ert IMS Titarill	in Sample	er INS Titari	Jun Samp	s cert IMS	itanii)
The state of the s	TOMER PART	Samp	QUANTITY LADING NO	. 75	SHIPMENT DATE	
PTG59620 V		<del>\(\frac{1}{2}\)</del>	905 lbs 00095757		09/05/2018	1.40/
PART INFORMATION 11' TI SAL 4V CG Bar - 0.500" Di	1DD2FTA05000	7.	S	200	C81	
Specifications: AS6279 Rev: Rev: D; AMS-T-9047 Rev: 03 Rev: D; MIL-H-81200 Rev: B; Rev: 2015; S-400 Rev: 16; S- Rev: AE Size: 0.500" Dia. +/- 0.0005" Length: 10' to 12' Random Le	MIL-T-9047 Ti 6-4 Rev: 0 DMS 1570 Rev: C; ASTN 1000 Rev: 2017; EN 1020	G; AMS-STD-2154 Re	v: C; MIL-STD-2154 R	ev: 82; AMS-H-812	00	(itan)
- A		7 (20)	<u> </u>	6, 16		
Heat Al T Al	B ( )	Chemical Report (		50		KILO
VT VB Y	0 .029 ,029	Fe T Fe B .16 .20 Ot E TOE .20	NT NB .017 014	OT OB .16	he Ing	
ريان النازي		Hydrogen (As Ship	oped)	60		Vito.
Hydrogen (%) 0.0028	T M	'W		~	C	h .
VIII COLL	X	As Shipped Prope	ution.	- in	18 M	
UTS #1 (psi)	YS 0.2% #1 (psi)	As Shipped Prope		RA#1 (%)	6, 7,	1
161100	148500	15		48		.x2
UTS #2 (pai) 161000	YS 0.2% #2 (psi) 148200	EL#2	(%)	RA #2 (%) 48	Co	
Hardness (HRC)		in, John	YM,	70	10	5
38	A PERSON OF A PERS		` <u>`</u>	CI.	6.	
LITS #4 (neil)			1000°F (538°C) 4hrs A			1
UTS #1 (psi) 177100	YS 0.2% #1 (psi) 165500	EL #1 (	%)	RA #1 (%) 46	C.O.	1 / illo
Hardness (HRC)	VM.	The Ye	(M)		.01	S
43	- XX	, and the second		- All	10 × 10	
9	Capability	@1740°F 1hr WQ +1	000°F 4hrs AC	X.O.		
Titanium ample	- LINS	hium aple	Co THIS	illin Sia	Cer	No Life
Qtc302 (v6.0)	Cert MS The	Page 1 o	f3 cett	TA Date	e Printed: 09/05/2018	, ani
STitanium Sample		Milli Mo	s LW2	RillM	ole ve	2 lifton
	CO' 1	60	X	·KO.	Un M	



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DYNAMET	195 Miceum Road Weshington, PA 15301		ALES ORDER IRLS	
A Carpenter Company	Phone 724,228,1000 Fax 724,229,4195	519826	065755 / 001	Ui:
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The call of a	1, Wb, 1/2,	- illi	U 18.	
CUSTOMER P.O. CUSTOMER PART PTG59620		DING NO 0095757	SHIPMENT DATE	III
UTS #1 (psi) YS 0.2% #1 (ps	EL#1 (%)	RA#1 (%)	09/05/2018	91.
176300 163900 UTS #2 (psi) YS 0.2% #2 (ps		48 RA #2 (%)	Co G	
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Melt Source		in So	6	
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(3)	the office		10, 12	



195 Mareum Ro Washington, PA 15301

**Р**ноло 724.228.1000 724.229.4195

#### PRODUCT CERTIFICATION

Sample Cert

NS Titanium Sampl

TMS Titanium S SALES ORDER / RLS 065755 / 001

anium

CUSTOMER P.O.

CUSTOMER PART

TMS Titanium Sample QUANTITY LADING NO

SHIPMENT DATE

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ample Cert TMS

PTG59620

Sample Cert INIS

09/05/2018

CERTIFICATION REQUIREMENTS

Material designation: UNS R56400

Material free of alpha case, or other surface contamination.

Macrostructure and microstructure meet all requirements of MIL-T-9047.

Material annealed in accordance with MIL-H-81200 and AMS-H-81200.

Hydrogen analysis from final product.

Material immersion ultrasonic inspected in accordance with MIL-STD-2154 CL AA Type 1,

AMS-STD-2154 CL AA Type 1 and AMS 2831 CL AA Grade 1 #2 FBH - ALL ACCEPTED.

Material free of mercury and radioactive contamination.

Material certified to the requirements of MIL-T-9047G Cond.A (Dated - 12/15/78),

MIL-T-9047G Amendment 2 (Dated - 09/30/88), MIL-T-9047G Notice 1 (Dated - 2/8/93) and

MIL-T-9047G Notice 2 (Dated - 4/4/98).

DRC Conflict Free Material

Material conforms to RoHS Directive 2011/65/EU.

Mechanical properties; Hydrogen analysis and microstructure evaluations performed at Product Evaluation System, Naticap & GE approved, GE Vendor Code 19377.

100679343 per exceptions Rev: AB- Paragraph 4.6 Documents retained per QA-31.

Complete copy of the original material chemistry attached

itanium Sample Cert Q. A. Lab Manager TMS Titanium Sample Cert

TMS Titanium Sample Cent TWE

TMS Titanium Sample Cert

itanium Se

AAC Titanium

Mille Cert

09/05/2018

This is to certify that the above test results are correct as contained in the records of the company.

Lab M. Lab M. Cert This Titanium Sample Cert TMS Titanium Sample Cert Certification shall not be reproduced except in full without the approval of Dynamet Inc. The Sample Cert This Sample Cert This Titanium recording of false, ficticious or fraudulent statements or entries on this document may be punished as a felony under Federal Law.

-art TMS



TAS TITAL

## TMS Titanium Samp CERTIFICATE OF TEST Cert No.166870 Rev.1

The sanium sample

Hanium WS Tita hum S Batch G 161616 Heat -H7L69

	Specialty Materials ATI Richburg Operations, 4374 Lancaster Highway, Richburg, SC 29729 US	ert TMS Titamie	Cent No.166870	Rev. 1  Done Certifi	Batc 1616 Heat H7L6 Und W. James\es Cation Auditor Gruary 12, 2018	16
	5	0) 1/10	- A			10
	Customer Name & Address	Purchase Order No	Part No	Sales Order	Vo Sales Order	Line No
_	July Who	The sill	838649	88340	50 1.1	(ito
	Size (in)	Cross section	No Pos	Weight (lbs)	Alloy 🗸	5
	4.0000	Round	38	14,014	ATI 6-4" AL	loy
	Remarks:	5	5		2	
×	BCA-65325-1194 Purchased For: Dyname	et and			x X	
	Customer PO#: 068314 Customer P/N: 111PX6-	& Item# 002	.0	6	50	<b>(1)</b>
	TMX W/O: K16405 TMX Part#: 838649	A CALLED	Whi.	TM2		Sì

Specifications

Spec Name	 Rev	Compliance Condition
DI-1036	C	Compliant
DI-2111	В	Compliant

Reference Specifications

Spec Name	Rev	Class	Compliance Condition
AMS 4928	V		Capable Of
ASTM B348	2013	GRADE=5	Capable Of
D1 -4426	JWL	CO	Compliant
D6-81628	В	0 6	Compliant
D6-82479	G		Compliant

Capable Of: ATI Specialty Materials guarantees material will meet specification requirements in the final product after additional appropriate processing but may not be tested in the 'As Shipped' condition.

As Shipped Condition

Heat Treat	Hot Work Type	
No Heat Treat	Forged	
Surface Finish	Je 1, 10, 10	
Peel/Shave & Polish	(4)	

#### Melt Method Details

Primary Melt		Cand Iday				V XO
		Facility		Address	5 co	
Vacuum Arc Remelt	M	ATI Bakers North (	Operations	ATI Bakers	North Operations , NC 28110-8329 U	6400 Alloy
Remelt	Facility	No.	Address		ate	3
Vacuum Arc Remelt	ATI Bakers	s North Operations		Operations 1	2/10/2017	X
2		To Co.	ATI Bakers North 6400 Alloy Way, 28110-8329 US	Monros NC		
		<del></del>	20110-0329-03		<del></del>	· · ·
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#### CHEMISTRY

5.	Same Cert Tital	camp, it itali	in the the in
	ATI Specialty Materials-ATI Richburg Operations,4374  Batch - 161616  CHEMISTRY	4 Lancaster Highway,Richburg, SC 29729 US <b>Heat -</b> H7L69	asali cert Titami
	Sample Source Test Facility		Bottom ATI Monroe Operations
		6.12	6.20
N	Fe % XRF	0.16	0.20
- 1	N % GAS Cu % WET	.017	.029 .014 <0.01
- 1	S1 % XRF	<0.01	<0.0009 <0.01 <0.0009
- 1	Ti XRF	7	BAL

Test Comments: Other Elements (ea Total Other Elements = 0.20 wt.%	ch) = 0.05 wt % max.	- Alle Open The
Remarks: CS = Combustion/IR Detection GAS = Inert Gas Fusion	ium de c	The sall cert (11)
XRF = X-Ray Fluorescence WET = Inductively Coupled Plasma	Emission (N)	ium de MS
Piece ID	T1-1-1-1	83-3-3-2
Test Facility Elements UOM Method	ATI Monroe Operations	ATI Monroe Operations
H % GAS Test Description: Hydrogen: Bill	0.0014 et - 0.25" Below Surface	0.0017

#### Remarks:

Test Methods: C = ASTM E1941 (2010/2016); O/N = ASTM E1409 (2013); H = ASTM E1447 (2009/2016); ICP = ASTM E2371 (2013); XRF = ASTM E539 (2011)

#### METALLOGRAPHY

#### Remarks:

Beta Transus Calculated by Chemistry:

1829 F. = TOP 1823 F. = BOTTOM

#### Ultrasonic

Test Facility: ATI Richburg Operations

Remarks:

Material ultrasonically inspected and found acceptable to the following specifications: AMS 2631 Class A1 AMS-STD-2154 Type I Class A

#### Macro

Test Facility		Etchant	C.0	Mag	nification	
ATI Monroe Operations	100	Ammonium Bifluoride		G 1X	9	60
Remarks:	M		0		~	6

Material macro evaluated top, middle and bottom of each ingot and found acceptable. Outside Source Addresses

Outotac Coul of Addi 63363	
Outside Testing Laboratory	
Facility	Address
ATI Monroe Operations	2020 Ashcraft Avenue, Monroe, NC 28110 USA

#### Maps Attached

Attached File Description(s):

1) BAR MAPS

#### Other Attached Files

Attached File Description(s):

1) QF 315-178A

#### Special Remarks

TMSTitanil cample cer Material produced and controlled in accordance with T.I. SSA Dynamet-001 Rev.004 a. TMS comple cert

1

ATI Specialty Materials-ATI Richburg Operations, 4374 Lancaster Highway, Richburg, SC 29729 US

Batch - 161616

Heat -H7L69

#### Remarks

Material has been produced, sampled, inspected and tested in accordance with the acknowledged customer purchase order and referenced specifications and conforms to the requirements unless otherwise noted in this Certificate of Test or in other communications regarding purchase order clarifications, specification exceptions, or long term agreements."

If customer purchase order does not specifically reference a revision to a specification, ATI Specialty Materials will work to the latest revision on file and in effect at the time of order placement.

ATI Specialty Materials has complied with all producer requirements of AS6279.

Any chemical elements analyzed and found to have values below the actual limits of detection may be reported as < less than or reported at the detection level.

When values are reported to the significant places called for in the specifications, rounding will be done in accordance with ASTM E29.

This is to certify that during the manufacturing, handling, testing and inspection, this material did not come in direct contact with mercury or any device employing a single boundary of containment.

ATI Specialty Materials products have not come in contact with radioactive materials during manufacturing or processing.

No weld repair has been performed on this material.

- Printed copies are available upon request from the ATI Specialty Materials Sales Department.

  ATI Specialty Materials certifies that it has procedures in place to provide reasonable assurance that any non-scrap/non-recycled Conflict Minerals (Columbite-Tantalite/Coltan and its derivative metal Tantalum; Cassiterite and its derivative metal Tin; Wolframite and its derivative metal Tungsten; and Gold) included in the materials supplied under this purchase order do not originate from the Democratic Republic of Congo or specified adjoining countries (Covered Countries) as defined by and in accordance with Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2012. ATI Specialty Materials will provide a CMRT form annually upon request.

  The recording of false, fictitious, or fraudulent statements or entries on this document may violate Eddard statutes, including out not limited to Title 18, Chapter 47 of the United States. Titanium

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TMS Titanium Sample Cert. TWS Tranium Sample Cert This Certificate of Test shall not be reproduced, except in full, without the written approval of ATI Specialty TWS Tranium Sample Cert. TWS Tranium Sample Cert.