



G&S TITANIUM, INC.

4000 EAST LINCOLN WAY
WOOSTER, OHIO 44691
PHONE [330] 263-0564
gs-titanium.com

WIRE DRAWING SPECIALISTS

CERTIFICATE OF TESTS

CUSTOMER. CUST. PO.	PERFORMANCE TITANIUM PTG58753 LINE 2 ✓	DATE . G&S MO.	SEPTEMBER 01, 2017 58565
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MATERIAL DESCRIPTION

WEIGHT/QUANTITY

.052" X 72" S/L ✓	TI 6Al-4V ELI ✓	11.6 LBS.
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SPECIFICATIONS

HEAT NUMBER

✓ ASTM B863-14 GR.23, AWS A5.16-13 ERTI23- CHEMISTRY**	79AK ✓
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CHEMICAL COMPOSITION ✓

AL	6.05	V	4.04	FE	*.06	C	< *.01	O	*.06
N	*.005	TI	BALANCE	Y	< .0005	H	*.0019		.

*TESTED AT FINISH DIAMETER

MECHANICAL PROPERTIES

TENSILE STRENGTH [KSI]. 126.7 REPORTED FOR INFORMATION ONLY
 YIELD STRENGTH [KSI].
 ELONGATION % 4D .
 REDUCTION OF AREA % .
 STRESS RUPTURE .
 BETA TRANSUS TEMP. .
 HEAT TREAT TEMP/TIME . VACUUM ANNEALED 1350F - 1 HOUR AT TEMP ✓
 MACRO/MICRO STRUCTURE .
 MELT SOURCE . ATI WAH CHANG - USA ✓ ATTACHED
 CONDITION SHIPPED . AS DRAWN, STRAIGHTENED, CLEANED
 ASTM B863-14 GR.23; CHEMISTRY ONLY PER JENNA**

THIS STATEMENT IS TO CERTIFY THAT THE ABOVE MATERIAL HAS NOT COME INTO CONTACT WITH MERCURY OR ANY OF ITS ALLOYS OR ANY RADIOACTIVE ELEMENTS WHILE AT G & S TITANIUM. WE ALSO CERTIFY THAT THE ABOVE MATERIAL MEETS ALL REFERENCED SPECIFICATIONS AND CUSTOMER PURCHASE ORDER REQUIREMENTS UNLESS OTHERWISE NOTED. ✓

Dan Eagle
 DAN EAGLE / QUALITY ASSURANCE

GS-01 004 060110QM

INSP. 5
 DATE: 9.1.17



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CERTIFICATE OF TESTS

CUSTOMER. CUST. PO.	PERFORMANCE TITANIUM PTG58533 ✓	DATE G&S MO.	JULY 21, 2017 58285
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MATERIAL DESCRIPTION ✓

WEIGHT/QUANTITY ✓

.065" +/- .002" X 72" S/L TI 6Al-4V ELI ✓	20.00 LBS.
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SPECIFICATIONS

HEAT NUMBER

ASTM B863-14 GR.23, AWS A5.16-13 ERTI23 ✓	79AK
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CHEMICAL COMPOSITION ✓

AL	6.05	V	4.04	FE	*.10	C	*.01	O	*.08
N	*.0032	TI	BALANCE	Y	< .0005	H	*.0014		.

*TESTED AT FINISH DIAMETER

MECHANICAL PROPERTIES ✓

TENSILE STRENGTH [KSI]. 122.2
 YIELD STRENGTH [KSI].
 ELONGATION % 4D . 14.8
 REDUCTION OF AREA % .
 STRESS RUPTURE .
 BETA TRANSUS TEMP. .
 HEAT TREAT TEMP/TIME .
 MACRO/MICRO STRUCTURE .
 MELT SOURCE . ATI WAH CHANG - USA ✓
 CONDITION SHIPPED . AS DRAWN, STRAIGHTENED, CLEANED
 FLAG TAGS ON ONE END
 MELT CERTS ATTACHED

THIS STATEMENT IS TO CERTIFY THAT THE ABOVE MATERIAL HAS NOT COME INTO CONTACT WITH MERCURY OR ANY OF ITS ALLOYS OR ANY RADIOACTIVE ELEMENTS WHILE AT G & S TITANIUM. WE ALSO CERTIFY THAT THE ABOVE MATERIAL MEETS ALL REFERENCED SPECIFICATIONS AND CUSTOMER PURCHASE ORDER REQUIREMENTS UNLESS OTHERWISE NOTED.

CHAD BRADDOCK / QUALITY ASSURANCE

GS-01 004 060110QM

INSP. 3

DATE: 7-21-17



G&S TITANIUM, INC.

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WOOSTER, OHIO 44691
PHONE [330] 263-0564
gs-titanium.com

WIRE DRAWING SPECIALISTS

CERTIFICATE OF TESTS

CUSTOMER. CUST. PO.	PERFORMANCE TITANIUM PTG58753 LINE 1 ✓	DATE . G&S MO.	AUGUST 25, 2017 58564
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MATERIAL DESCRIPTION	WEIGHT/QUANTITY
✓ .082" +/- .002" X 72" S/L TI 6Al-4V ELI ✓	11.20 LBS. ✓

SPECIFICATIONS ✓	HEAT NUMBER
ASTM B863-14 GR.23, AWS A5.16-13 ERTI23	79AK ✓

CHEMICAL COMPOSITION ✓

AL	6.05	V	4.04	FE	*.09	C	*.01	O	*.07
N	*.0050	TI	BALANCE	Y	< .0005	H	*.0014		.

*TESTED AT FINISH DIAMETER

MECHANICAL PROPERTIES ✓

TENSILE STRENGTH [KSI]. 123.5
 YIELD STRENGTH [KSI].
 ELONGATION % 4D . 17.0
 REDUCTION OF AREA % .
 STRESS RUPTURE .
 BETA TRANSUS TEMP. .
 HEAT TREAT TEMP/TIME . VACUUM ANNEALED 1400F - 1HR. AT TEMP ✓
 MACRO/MICRO STRUCTURE .
 MELT SOURCE . ATI WAH CHANG - USA ✓
 CONDITION SHIPPED . *VACUUM ANNEALED, STRAIGHTENED, CLEANED ✓
 NO FLAG TAGS PER JENNA
 MELT CERTS ATTACHED

*AMENDED CONDITION AND ADDED HEAT TREATMENT ON 9-5-2017

THIS STATEMENT IS TO CERTIFY THAT THE ABOVE MATERIAL HAS NOT COME INTO CONTACT WITH MERCURY OR ANY OF ITS ALLOYS OR ANY RADIOACTIVE ELEMENTS WHILE AT G & S TITANIUM. WE ALSO CERTIFY THAT THE ABOVE MATERIAL MEETS ALL REFERENCED SPECIFICATIONS AND CUSTOMER PURCHASE ORDER REQUIREMENTS UNLESS OTHERWISE NOTED.

CHADD BRADDOCK / QUALITY ASSURANCE

GS-01 004 060110QM

INSP. 5
DATE: 9.5.17



DYNAMET

A Carpenter Company

195 Museum Road
Washington, PA 15301

Phone 724.228.1000
Fax 724.228.4195

PRODUCT CERTIFICATION

WORK ORDER
517398

SALES ORDER / RU
063484 / 00

SHIP TO

Performance Titanium Group
8400 Miramar Rd
Suite # 200-248C
San Diego, CA 92126
USA

CUSTOMER P.O. PTG58848 ✓	CUSTOMER PART 121DD2JES01875	QUANTITY LADING NO 597 lbs 00091143	SHIPMENT DATE 01/16/2018
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PART INFORMATION 121DD2JES01875
 ✓ **TI 6AL 4V ELI CG Bar - 0.1875" Dia. ✓**
Specifications: ASTM F 136 Rev: 13; ASTM B 348 Gr23 Rev: 13; ISO 5832-3 Rev: 2016; AMS 6932 Rev: B; AMS 4930 Rev: H; EN 10204 3.1 Rev: 04; MIL-T-9047 Ti 6-4ELI Rev: G; AS6279 Rev: A; ASTM B 348 Gr5 Rev: 13; AMS 4928 Rev: V; AMS 6931 Rev: C; ASTM F 1472 Rev: 14 ✓
Size: 0.1875" Dia. +/- 0.0005" ✓
Length: 10' to 12' Random Length

✓ **Chemical Report (Wt.%)**

Heat	Al T	Al B	C T	C B	Fe T	Fe B	N T	N B	O T	O B
H28778	6.06	6.05	.032	.030	.16	.15	.001	.001	.10	.10
V T	V B	Y T	Y B	Ti	Ot E	TOE				
4.16	4.17	<.0004	<.0004	BAL	<.10	<.30				

✓ **Hydrogen (As Shipped)**

Hydrogen (%)
0.0028

✓ **As Shipped Properties**

UTS #1 (psi)	YS 0.2% #1 (psi)	EL #1 (%)	RA #1 (%)
153800	137500	15	50
UTS #2 (psi)	YS 0.2% #2 (psi)	EL #2 (%)	RA #2 (%)
151900	135100	13	42
Hardness (HRC)	34		

✓ **Metallography Results**

Macrostructure
Acceptable
Microstructure
Alpha-Beta
Similar to Pub. ETTT 2 / ISO 20160 Plate: A1
Alpha Case
Material Free of Alpha Case

INSP. 3
DATE: 1-17-18

Date Printed: 01/16/2018



DYNAMET

A Carpenter Company

195 Museum Road
Washington, PA 15301

Phone 724.228.1000
Fax 724.228.4195

PRODUCT CERTIFICATION

WORK ORDER
517398

SALES ORDER / RU
063484 / 00

SHIP TO

Performance Titanium Group
8400 Miramar Rd
Suite # 200-248C
San Diego, CA 92126
USA

CUSTOMER P.O. PTG58848 ✓	CUSTOMER PART 121DD2JES01875	QUANTITY LADING NO 597 lbs 00091143	SHIPMENT DATE 01/16/2018
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PART INFORMATION 121DD2JES01875
 ✓ **TI 6AL 4V ELI CG Bar - 0.1875" Dia. ✓**
Specifications: ASTM F 136 Rev: 13; ASTM B 348 Gr23 Rev: 13; ISO 5832-3 Rev: 2016; AMS 6932 Rev: B; AMS 4930 Rev: H; EN 10204 3.1 Rev: 04; MIL-T-9047 Ti 6-4ELI Rev: G; AS6279 Rev: A; ASTM B 348 Gr5 Rev: 13; AMS 4928 Rev: V; AMS 6931 Rev: C; ASTM F 1472 Rev: 14 ✓
Size: 0.1875" Dia. +/- 0.0005" ✓
Length: 10' to 12' Random Length

✓ **Chemical Report (Wt.%)**

Heat	Al T	Al B	C T	C B	Fe T	Fe B	N T	N B	O T	O B
H28778	6.06	6.05	.032	.030	.16	.15	.001	.001	.10	.10
V T	V B	Y T	Y B	Ti	Ot E	TOE				
4.16	4.17	<.0004	<.0004	BAL	<.10	<.30				

✓ **Hydrogen (As Shipped)**

Hydrogen (%)
0.0028

✓ **As Shipped Properties**

UTS #1 (psi)	YS 0.2% #1 (psi)	EL #1 (%)	RA #1 (%)
153800	137500	15	50
UTS #2 (psi)	YS 0.2% #2 (psi)	EL #2 (%)	RA #2 (%)
151900	135100	13	42
Hardness (HRC)	34		

✓ **Metallography Results**

Macrostructure
Acceptable
Microstructure
Alpha-Beta
Similar to Pub. ETTT 2 / ISO 20160 Plate: A1
Alpha Case
Material Free of Alpha Case

INSP. 3
DATE: 1-17-18

Date Printed: 01/16/2018



195 Museum Road
Washington, PA 15301

Phone 724.228.1000
Fax 724.229.4196

PRODUCT CERTIFICATION

WORK ORDER
515446

SALES ORDER / RLS
060351 / 001

SHIP TO

Performance Titanium Group
8400 Miramar Rd
Suite # 200-248C
San Diego, CA 92126
USA

CUSTOMER P.O. PTG57742 ✓	CUSTOMER PART 121DD2JBR03125	QUANTITY LADING NO ✓ 309 lbs 00087358	SHIPMENT DATE 06/22/2017
PART INFORMATION TI 6AL 4V ELI CG Bar - 0.3125" Dia. ✓ Specifications: ASTM F 136 Rev: 13; ASTM B 348 Gr23 Rev: 13; ISO 5832-3 Rev: 2016; AMS 6932 Rev: E; AMS 4930 Rev: H; BS 7252 Rev: 1997; EN 10204 3.1 Rev: 04; MIL-T-9047 Ti 6-4ELI Rev: G; AMS-T-9047 Rev: 03; S-1000 Rev: 13; S-400 Rev: 15; AS6279 Rev: A; AMS 4928 Rev: W; ASTM B 348 Gr5 Rev: 13 ✓ Size: 0.3125" Dia. +/- 0.0005" Length: 10' to 12' Random Length			
✓ Chemical Report (Wt.%)			
Heat H27381	Al T 6.00	Al B 6.04	C T .033
V T 4.10	V B 4.12	Y T <.0004	Y B <.0004
C B .032	Fe T .18	Fe B .18	N T .006
Ti BAL	O t E <.10	TOE <.30	N B .005
O T .11	O B .11		
✓ Hydrogen (As Shipped)			
Hydrogen (%) 0.0023			
✓ As Shipped Properties			
UTS #1 (psi) 156000	YS 0.2% #1 (psi) 138700	EL #1 (%) 13.6	RA #1 (%) 44.3
UTS #2 (psi) 154900	YS 0.2% #2 (psi) 137400	EL #2 (%) 15.3	RA #2 (%) 50.5
Hardness (HRC) 37			
✓ Metallography Results			
Macrostructure Acceptable Microstructure Alpha-Beta Similar to Pub. ETTC 2 Plate: A1 Alpha Case Material Free of Alpha Case			
			PTG QA 1 Approved 3-13-18