



Verkhinaya Saldá

Metallurgical Production Association

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**ANNEX TO
INSPECTION
CERTIFICATE**



EN 10204-1B ISO 9002 CERT. N.º 20 100 82200

Requirement: C50TF22-S17 C1C par. 3.1 (C1A)

ANNEX 1 CERTIFICATE 02086Y04A

Purchaser: YSMPO TIRUS, USA
Quantity of Bars: 277

Quantity of Samples: _____
Product: Bar

Heat 8-46-3285
Lot 608-1

| Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | Bar # | | | | | | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|--------|-------|-------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 71 | 86 | 96-1 | 108-6 | 124 | 136 | 148-5 | 163 | 178 | 189-4 | 202 | 217 | 229-3 | 238-8 | | | | | | | | | | | | | | | | | | | | | |
| 72 | 88 | 98-2 | 109-7 | 125 | 139-1 | 149-6 | 164 | 179 | 189-5 | 203 | 218 | 229-4 | 238-9 | | | | | | | | | | | | | | | | | | | | | |
| 73 | 87 | 98-3 | 111 | 126 | 139-2 | 149-7 | 165 | 179-1 | 189-6 | 204 | 219 | 229-5 | 239-10 | | | | | | | | | | | | | | | | | | | | | |
| 74 | 88 | 98-4 | 112 | 127 | 138-3 | 151 | 166 | 179-2 | 189-7 | 205 | 219-1 | 229-6 | 239-11 | | | | | | | | | | | | | | | | | | | | | |
| 75 | 89 | 98-5 | 113 | 128 | 139-4 | 152 | 167 | 179-3 | 189-8 | 206 | 219-2 | 229-7 | | | | | | | | | | | | | | | | | | | | | | |
| 76 | 89-1 | 99-6 | 114 | 129 | 139-5 | 153 | 168 | 179-4 | 189-9 | 207 | 219-3 | 229-8 | 239 | | | | | | | | | | | | | | | | | | | | | |
| 77 | 89-2 | 99-7 | 115 | 130 | 139-6 | 154 | 169 | 179-5 | 189-10 | 208 | 219-4 | 229-9 | 239-1 | | | | | | | | | | | | | | | | | | | | | |
| 78 | 89-3 | 101 | 116 | 129-2 | 139-7 | 155 | 170 | 189-6 | 194 | 208 | 219-5 | 232 | 233 | | | | | | | | | | | | | | | | | | | | | |
| 79 | 89-4 | 102 | 117 | 129-3 | 141 | 156 | 169-1 | 179-6 | 189-7 | 209 | 219-6 | 234 | 235 | | | | | | | | | | | | | | | | | | | | | |
| 79-1 | 89-5 | 103 | 118 | 129-4 | 142 | 157 | 169-2 | 179-7 | 189-8 | 209-1 | 219-7 | 236 | 237 | | | | | | | | | | | | | | | | | | | | | |
| 79-2 | 89-6 | 104 | 119 | 129-5 | 143 | 158 | 169-3 | 181 | 189 | 209-2 | 219-8 | 236 | 238 | | | | | | | | | | | | | | | | | | | | | |
| 79-3 | 89-7 | 105 | 119-1 | 129-6 | 144 | 159 | 169-4 | 182 | 197 | 209-3 | 221 | 236 | 239 | | | | | | | | | | | | | | | | | | | | | |
| 79-4 | 91 | 106 | 119-2 | 129-7 | 145 | 159-1 | 169-5 | 183 | 198 | 209-4 | 222 | 237 | 238 | | | | | | | | | | | | | | | | | | | | | |
| 79-5 | 92 | 107 | 119-3 | 131 | 146 | 159-2 | 169-7 | 185 | 199-1 | 209-5 | 223 | 238 | 239 | | | | | | | | | | | | | | | | | | | | | |
| 79-6 | 93 | 108 | 119-4 | 132 | 147 | 159-3 | 171 | 186 | 199-2 | 209-6 | 225 | 239-1 | | | | | | | | | | | | | | | | | | | | | | |
| 79-7 | 94 | 109 | 119-5 | 133 | 148 | 159-4 | 172 | 187 | 199-3 | 211 | 226 | 239-2 | | | | | | | | | | | | | | | | | | | | | | |
| 79-8 | 95 | 109-1 | 119-6 | 134 | 149 | 159-5 | 173 | 188 | 199-4 | 212 | 227 | 239-3 | | | | | | | | | | | | | | | | | | | | | | |
| 81 | 96 | 109-2 | 119-7 | 135 | 149-1 | 159-6 | 174 | 189 | 199-5 | 213 | 228 | 239-4 | | | | | | | | | | | | | | | | | | | | | | |
| 82 | 97 | 109-3 | 121 | 138 | 149-2 | 159-7 | 175 | 189-1 | 199-6 | 214 | 229 | 239-5 | | | | | | | | | | | | | | | | | | | | | | |
| 83 | 98 | 109-4 | 122 | 137 | 149-3 | 161 | 176 | 189-2 | 199-7 | 216 | 229-1 | 239-6 | | | | | | | | | | | | | | | | | | | | | | |
| 84 | 99 | 109-5 | 123 | 138 | 149-4 | 162 | 177 | 189-3 | 201 | 218 | 229-2 | 239-7 | | | | | | | | | | | | | | | | | | | | | | |

- Notes:
- Total quantity of bars: 277
 - Bars excluded from the lot: N/A
Nonconformace/ Bar #: _____
 - Bars excluded from the lot due to US-results: N/A
 - Weight: _____ kg
Internal Defects: _____
Surface Defects: _____

3. Bar length min 2440 mm: 73,74,75,239-2,239-3

Prepared by: Dushina A.A.
Name: Dushina A.A.

Signature

Stamp



Original Cert #
02080404A

CERTIFICATE OF REPORT NF & M INTERNATIONAL, INCORPORATED

1729 PENNSYLVANIA AVENUE, MONACA, PENNSYLVANIA 15061 Ph. 724-774-9200/FAX 724-728-2544

| | |
|--|--|
| Customer: VSMPO - TIRUS, US - LEETSDALE 401 RIVERPORT DRIVE LEETSDALE PA 15056 ATTN: ACCOUNTS PAYABLE | Ship To: VSMPO - TIRUS PA WAREHOUSE 401 RIVERPORT DRIVE LEETSDALE PA 15056 ATTN: CHRIS CHMURA |
|--|--|

| | | | |
|--|---------------------------------|------------------------------------|----------------------------------|
| NF&M Work Order 09883 | Ingot No. 8-46-3295 | Size .750 In RND | Customer P.O. 29463-NI |
| NF&M Sales Order OC3686-00 | Material Titanium 6-4 | Description ANNEALED BAR | Report Date 11/14/2013 |

SPECIFICATIONS: AMS4928T, ASTM B348-13

PRODUCT CHEMISTRY

| | | | |
|------------------------|----|----|------------------------|
| Sample | 75 | 81 | |
| Hydrogen (ppm) surface | 13 | 10 | Hot extraction method. |

TENSILE PROPERTIES (HEAT TREAT ID 1) (FULL SECTION PROPERTIES)

| | | |
|------------------------------|-------|------|
| Sample/Dir | 112/L | 72/L |
| Ultimate (KSI) | 143 | 144 |
| Yield (KSI) (0.2% offset) | 132 | 135 |
| 4D Elongation (%) | 18 | 18 |
| Reduction (%) | 51 | 51 |

HEAT TREATMENT

Type: VACUUM ANNEALED
 1) Temp (F): 1300 Duration (Hrs): 1.25 Argon Quenched
 Performed at Solar Atmospheres Inc.; 30 Industrial Road; Hermitage, PA 16148

MACRO

Acceptable to AMS2380 REV. F, LEVEL 10

MICRO

Acceptable to AMS4928T Para 3.5.1.2.1 (L)

REMARKS

Material conforms to the requirements of this purchase order.
 ALLOY TYPE TESTING - OK
 No Alpha Case present
 All properties performed at room temperature unless specified otherwise.
 All testing performed at NF&M INTERNATIONAL unless specified otherwise
 Material supplied or processed on this purchase order has not come in direct contact with mercury or it's compounds nor with any mercury containing device employing a single boundary of containment

SHIPPING DATA

Weight: 2606#

QUALITY CONTROL

Jeffrey Keefer
 JEFFREY KEEFER, LAB TECHNICIAN CLASS 2



THE RECORDING OF FALSE, FICTITIOUS, OR FRAUDULENT STATEMENTS OR ENTRIES ON THE CERTIFICATE MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL LAW.

THE TEST REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT WRITTEN APPROVAL OF NF&M QUALITY.



Verkhnyaya Saida
Metallurgical Production Association

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Fax (34345) 2-47-36, 2-05-00
Telex 348176, 348177 "SEVER"

**INSPECTION
CERTIFICATE**

EN 10204-3.1, B ISO 9002 CERT. No 08 100 55266



date: 06/03/2004

CERTIFICATE No: 02086Y04A
Purchaser: VSMPO TRUS U.S.A.
Quality/Alloy: Ti6Al4V

Condition of delivery: Hot Rolled, Machined & Pickled.

Contract: 84021101TMV Annex 1
Purchaser order: 11542
Terms of delivery: C50TF22-S17 Cl.C par. 3.1 (CIA)

Item No: 277
Units: 1185/26125

Object: B.A.R.

Dimensions (mm/inch) or Drawing: dia 19.05 X 3050 - 3850/0.750X120-143.7

Heat No: 8-46-3295

Lot No: 608-1

Chemical Composition, %: Ti-remainder

| Requirement | Al | Mn | Mo | V | Zr | Cu | Sn | C | Fe | Y | B | O ₂ | N ₂ | H ₂ | Residuals, % | In the Part, % | |
|------------------|-----------|----------|----------|-----------|----------|----------|----------|----------|----------|-----------|------------|----------------|----------------|----------------|---------------|----------------|------------|
| C50TF22-S17 Cl.C | 5.50-6.75 | max 0.10 | max 0.10 | 3.50-4.50 | max 0.10 | max 0.10 | max 0.10 | max 0.05 | max 0.30 | max 0.005 | max 0.0014 | max 0.20 | max 0.05 | max 0.0125 | each max 0.10 | total max 0.20 | as-pickled |
| TOP | 8.32 | 0.003 | 0.018 | 3.83 | 0.020 | 0.006 | 0.005 | 0.003 | 0.071 | 0.0001 | <0.0014 | 0.194 | 0.008 | 0.0014 | <0.10 | 0.058 | 72 |
| BOTTOM | 8.48 | 0.004 | 0.018 | 4.03 | 0.020 | 0.006 | 0.005 | 0.003 | 0.074 | 0.0001 | <0.0014 | 0.170 | 0.008 | 0.0016 | <0.10 | 0.063 | 239-10 |

| Requirement | 0.20% proof stress MPa | Tensile strength MPa | Elonga-tion % | Reduc-tion % | Sample # | Para-mentary T ^o , F | Heat treatment T ^o , F | time |
|------------------|------------------------|----------------------|---------------|--------------|----------|---------------------------------|-----------------------------------|-------------|
| C50TF22-S17 Cl.C | 827 | 886 | 10 | 25 | | | | |
| | 71 | 904 | 984 | 16.5 | 50.3 | TOP | 1801.4 | 1299 |
| | 72 | 908 | 982 | 16.5 | 52.2 | BOTTOM | 1819.4 | air cooling |
| | 239-10 | 890 | 966 | 16.9 | 53.2 | | | |
| | 239-11 | 883 | 961 | 16.7 | 53.5 | | | |

Macrostructure testing: As per AMS 2380F Level 10. No defects found (P3TF25). No segregation detected (C50TF22), S470G.

Microstructure testing: As per C50TF22 Levels 10,20, single area 50, par. 3.3.8 (free from alpha-case);

Photo 320817, 320819; S470G.

Ultrasonic inspection: As per P3TF34, S4, CIA, Longitudinal & Shear wave.

We certify that, subject to exceptions or reservations listed hereunder, the supplies detailed here were manufactured in accordance with the technical specifications of the contract, order or sub-order and that all inspectors' specifications and tests, having been considered, the supplies comply in every respect with the relevant particular specifications, drawings, and relevant standards and regulations in force.
Information particular to the supplies concerned:
Specify the reference of documents granted.
Product is manufactured by VSMPO.
Bar production to the established process.
GEAENVSMPO S.A.L.-1 Agreement, MP 39.004GE-00 Rev.F; MP 39.006GE-00 Rev.D; MP 39.012GE-00 Rev.F.
See Annex 1

100% analysis for alloy compliance, no burnt areas.

Prepared by: Dushina A.A.
Name: Dushina A.A.

signature

