

VDM® Alloy X-750 Nicrofer 7016 TiNb



Nicrofer 7016 TiNb is a precipitation hardenable nickel-chromium-iron alloy containing titanium, niobium and aluminium, exhibiting good corrosion resistance at high and low temperature and high strength up to 820 °C (1500 °F).

It can be delivered in the solution-treated or precipitation-hardened condition.

Nicrofer 7016 TiNb is characterized by:

- high tensile strength up to 600 °C (1100 °F)
- high creep and rupture strength up to 820 ℃ (1500 °F)

- high oxidation resistance up to 980 °C (1800 °F)
- excellent mechanical properties in cryogenic environments
- good corrosion resistance at high and low temperatures and high resistance to stress corrosion cracking
- good welability by resistance and fusion processes

Designations and standards

| Country | Material designation | Justing miles | CARLO LING HILLS I | Street Control | Specifica | fication | | | | |
|-------------------------|------------------------------|----------------------|--------------------|---------------------|-------------------|------------------------------|--------------|--------------|-------------------|------------------------------|
| National standards | Stratus Stratus S | Chemical composition | Tube | eand pipe welded | Sheet and plate | R o d and bar | Strip | Wire | Street, | Forgings |
| Detection in the street | WNr. 2.4669 NiCr15Fe7TiAl | | ol Shalluanion | | ng dici | | | | Stretti. | |
| F AFNOR | NC15TNbA | | | | region Stratuesin | | | | Chath. | Silical Strategy |
| UK BS | | | | | | | Stratus and | | S. Malin | |
| USA ASTM ASME AMS | UNS N07750 | | | | | B637 SB637 | | The Time of | 100 | B637 SB637 |
| | | | 5582 | Startmann Start | 5542 5598 | 5667 5668 5669 5670 | 5542 5598 | 5698 5699 | Starting Starting | 5667 5668 5670 5671 |
| | | | | Statutani Stati | Stration Strategy | 5671 5741 5749 | Status and | Studing and | The state of | 5747 5749 |
| ISO | NiCr15Fe7Ti2Al | | | The true | 13 files | d Street him | - Raell' | 7.10 (G) | S will | Janus Riter Inch |

Table 1 – Designations and standards.

Chemical composition

| Sall | Strating allow | Ni | Cr | Fe | C | Mn | Signatura | Cu | Tiknomer & | Co | Nb | A | S |
|------|----------------|------|------|-----|----------|-------------------|-----------|------|------------|-------|------|------|-----------|
| | min. | 70.0 | 14.0 | 5.0 | regulari | "" S. Are II vale | | | 2.25 | | 0.70 | 0.40 | and Trans |
| | max. | | 17.0 | 9.0 | 0.08 | 1.00 | 0.50 | 0.50 | 2.75 | (1.0) | 1.20 | 1.00 | 0.010 |

Table 2 – Chemical composition (wt.-%).



Physical properties

 Density Melting range
 8.3 g/cm³
 0.30 lb/in.³

 Permeability at 20 °C/68 °F (RT)
 1395–1430 °C
 2540 – 2600 °F

 Curie temperature age hardned
 1.0035

 -125 °C
 -193 °F

| | Temperatu | ure (T) | Specific he | at Strate | Thermal conductivit | ty Stationarion | Electrical resistivity | Triaging Afraging | Modulus or elasticity | The Tree and | Coefficienthermal exbetween | xpansion |
|--------------|----------------|---------------|--------------------|-----------------------|---------------------|-------------------|------------------------|-------------------|-----------------------|--------------|-----------------------------|--|
| Ingalia: | | | Shaindhed Sha | Alusiisi Shafia | | | | Thereing Starting | | | room tem and T | perature |
| | C Tue Time and | Fuel transmer | J kg K | Btu lb°F | <u>W</u> m | Btu in. ft²h°F | μΩcm | Ω circ mil | <u>kN</u> ft mm² | 10³ ksi | <u>10-</u> 6 K | 10-6 *F |
| | 0 | 32 | | | | | | The alice | | | | |
| | 20 | 68 | 430 | 0.103 | 12.0 | 83 | 121 | 731 | 214 | 31.0 | | |
| | 93 | 200 | | 0.109 | | 89 | | 737 | | 30.0 | | 7.0 |
| | 100 | 212 | 460 | | 13.0 | | 123 | Alua juga | 206 | | 12.9 | nother and Stuffe |
| ing and | 200 | 392 | 480 | | 14.1 | | 124 | They Strate | 202 | | 13.4 | astrona Starti |
| ing a | 204 | 400 | | 0.116 | | 98 | | 748 | | 29.2 | | 7.1 |
| To alles | 300 | 572 | 500 | | 17.3 | | 126 | eting Strath | 196 | Strating . | 14.0 | or The State of th |
| | 316 | 600 | | 0.120 | Johns Justin | 109 | | 760 | elici Streit | 28.3 | Street. | 7.5 |
| | 400 | 752 | 520 | Tuda _{liter} | 17.9 | | 127 | The pincy Street | 190 | Story Con | 14.5 | The dies |
| | 427 | 800 | | 0.125 | | 120 | | 770 | aller 1 September 1 | 27.4 | | 7.8 |
| | 500 | 932 | 535 | | 18.5 | C. I. | 129 | 1,50 | 185 | Tugan | 14.8 | and the same of the Sta |
| | 538 | 1000 | Ane Ludanci | 0.130 | | 131 | Amazine in the | 783 | Carlot and | 26.7 | And Line alies | 8.1 |
| | 600 | 1112 | 560 | | 19.9 | Chapte and | 131 | Tingo 61 | 180 | The Tregator | 15.4 | of the start |
| | 649 | 1200 | P. And Lind on Co. | 0.137 | Sances Strative on | 143 | | 786 | State Tres also | 25.5 | | 8.4 |
| | 700 | 1292 | 600 | | 21.5 | | 130 | They may | 171 | Cited Same | 16.3 | |
| | 760 | 1400 | | 0.151 | | 154 | Anating siles | 775 | 3 51 | 24.0 | | 8.8 |
| | 800 | 1472 | 660 | | 22.8 | | 128 | Str. | 161 | | 17.1 | |
| | 871 | 1600 | | 0.171 | | 164 | Strating and St | 761 | | 22.1 | | 9.3 |
| To allege | 900 | 1652 | 750 | | 24.0 | STre Ting | 125 | etus | 149 | | 17.8 | |
| In Stall Co. | 982 | 1800 | | | | 173 | | Charles | | 20.0 | | 9.8 |
| | 1000 | 1832 | | | 25.3 | | | Andalia, Alegue | 135 | | | |

Table 3 – Typical physical properties at room temperature (or as indicated).



| · The | in the second se | ing the state of t | Constitution of the second | S. S. |
|-------------------------|--|--|--|-----------------|
| AMS | Heat- | Form | Dimensions | |
| trey. Strey. | treatment | | | |
| Areting Starting | The They | | | |
| No. | No. | 19.11. Paratusum Par | mm | Extra Lindon |
| 5542 | 5 The same | Strip | | < 0.25 |
| | | | 0.25- | < 0.60 |
| | | | ≥ 0.60 | |
| | | Sheet | 0.25 – | 0.60 |
| | | | > 0.60- | 3.20 |
| | | Strelling Str | > 3.20- | 6.35 |
| TEOO Stratings | Stations Stati | Plate | 4.75 – | 100 < 0.25 |
| 5598 | 2 Sturius Sturius | Strip | 0.25 – | < 0.25 |
| | | | ≥ 0.60 | Tatus Times |
| | | Sheet | 0.25 – | 0.60 |
| | | iauga Tuanga S. | > 0.60- | 3.20 |
| | | | > 3.20- | 6.35 |
| | | Plate | 4.75 – | 100 |
| 5667 | 4 Starting | Bar, forging | The Street in | ≤100 |
| | The Tree in She Ti | Stating St | 3 6 7 | >100 |
| 5668 | Tathorina That | Ring, bar, | | ≤250 |
| | her the filter | forging | to a super | |
| 5669 | 2 | Bar | The state of the s | < 60 |
| The alice | | | 60- | <100 |
| Co. Satura | Stray May | 20 1 2 m | ≥100 | Mary Street |
| 5670 | 2 | Bar, forging, ring | 00 | < 60 |
| Realing and Strating of | Etasting Startin | Tilly | 60- | <100 |
| 5671 | 2 | Par foreing | ≥100 | Slong Statu |
| 3071 | or Z | Bar, forging, ring | ≤ 60 | long transv. |
| | int The start | 11.00 | >60 - | 100 long |
| The special Street | | and the state of the | Tuaning Paging | transv. |
| and later | Star Jane | Carlos Stray | > 100 | |
| 5747 | 2 | Bar, forging, | Starting. | < 60 |
| STraftron's | | ring | 60- | <100 |
| Walindanies | | | ≥ 100 | |
| 5582 | 5 Tuesday Trette | Tubing | < 3.20 OD | 0.4 s |
| Lindaged Col | | | ≥ 3.20 OD | |
| 5698 | 8 | Spring wire | | ≤ 0.60 |
| | | | > 0.60- | 12.7 |
| | | | | |
| | | | | |
| 5699 | see | Wire | Elinamina, | 0.3 – 6.35 roun |
| | right | | | squar |
| | ing Chrodeling Chr | | > 6.3 | |
| | | | > 10.6 | |

Table 4a – Minimum mechanical properties at room temperature, metric values.

Mechanical properties

The following properties are applicable to Nicrofer 7016 TiNb in the hot and cold formed, solution-treated or solution-treated

Annealed

and precipitation-hardened condition, and the indicated size ranges. Material outside these size ranges (see availability) with agreed properties are subject to special enquiry.

Precipitation hardened

| | | Annealed | | | | | recipitation harde | | |
|--|----------------------|-------------------|---|---------------------------|--|--|--|------------------------------------|------------------|
| Tensile strength | 0.2 % Yield strength | Elongation | Brinell hardness | Grain size | Tensile strength | 0.2 % Yield strength | Elongation | Reduction of area | Brinell hardness |
| N/mm² | N/mm² | A 5 % | HB | e pm | N/mm² | N/mm² | A5 % | Z % | HB |
| 965 | re Induity | -Anethology | Ind year | as agreed | 1035 | named Arthamina | ne traines | And I wanter | Lugaina |
| 895 | | 20 | | | | | | | >300 |
| as agreed | | as agreed | | ≤152 | 1070 | | 15 | | |
| 965 | Ethering Starting | 30 | | | | | | | |
| 895 | 415 | | | ≤ 152 | 1140 | 725 | 20 | | >315 |
| 895 | 450 | 40 | | To The siles | To The piles | ng giles | ofing siles | | ating siles |
| 2,000 S) | - 100 Sh | | | | 1070 | 690 | 20 | | |
| 965 | | | | as agreed | 1070 | 030 | adv20 | | |
| 930 | | 18 | | | | | | | |
| | | 10 - 4ud They mad | | ≤ 64 | 1100 | | | | >300 |
| as agreed | CFAF CINGBER | 00 | | | | | | | |
| 930 | 515 | 30 | | Region of the stage | Stray Stray | | tage Stage | | egr. Skray. |
| 930 | 515 | 35 | | ≤ 64 | 1170 | 795 | 18 | | >315 |
| | | | | | | | | | a Trus ares |
| | | | | as agreed | 1100 | 725 | 18 | | > 300 |
| | | | ≤300 | | 1140 | 725 | 20 | 25 | 300 – 360 |
| | | | The Thefins | | 1100 | 690 | 15 | 17 | 300 |
| | Tellus allo, | | | 24 Lindago, 24 a Lindago, | 860 | 550 | and the same of th | 8 | 260 – 340 |
| | | | | The siles | 975 | 1930 Ting siles | 4 | Ting land | 200-340 |
| | | | | | 4470 | 30F 30F | 18 | 25 | 045 400 |
| | | | | | 1170 | 795 | 15 | 20 | 315 – 400 |
| | | | The Tries on | | as agreed | NO. THE REAL PROPERTY OF THE PARTY OF THE PA | are trees | September 1 | Line . |
| | | | | | | | | | |
| | | | | | Tue Ting pilot | and the same | 18 | 18 | Ting sales |
| | | | | | Stuff Property | ASTORY STATE OF THE STATE OF | 18 | 18 | 300 – 400 |
| | | | | The Transport | Station State | Magazi Staffars hi | 18 | 18 | 300 – 400 |
| | | | The series of the State of the series of the State of the series of the | | State of the state | Station of Stations | 18 | 18 | 300 –400 |
| | | | | | | | 18 | 18 | |
| | | | | | | A STATE OF THE STA | 18 | 18 | 300 – 400 |
| | | | | | | | 18 | 18 | |
| | | | | | | | 18 | 18 | |
| | | | | | | | 18 | 18 | |
| | | | | | | | 18 | 18 ≤ 320 | |
| | | | | | | | 18 | Statement of | 300 – 400 |
| Statement S | | | | | | | 18 | Statement of | 300 – 400 |
| as agreed | | | | | | | | Statement of | 300 – 400 |
| 965 | 550 | 30/35 | | ≤152 | 1070 | 690 | 15/20 | Statement of | 300 – 400 |
| 965 <1035 | 550 | 30/35 | | ≤152 | 1070 >1070 | 690 | | Statement of | 300 – 400 |
| 965 <1035 900 –1140 | | 30/35 | | ≤152 | 1070 | | 15/20 | ≤ 320 | 300 – 400 |
| 965 <1035 | | 30/35 | | ≤152 | 1070 > 1070 > 1140 | | | ≤ 320 | 300 – 400 |
| 965 <1035 900 –1140 As rec | ieved | 30/35 | | ≤152 | 1070 >1070 >1140 No. 9 | | 15/20 | ≤ 320 ent No. 1 | 300 – 400 |
| 965 <1035 900 – 1140 As rec | ieved | 30/35 | | ≤152 | 1070 > 1070 > 1140 No. 9 Tensile streng | | 15/20 | ≤ 320 ent No. 1 Tensile stre | 300 – 400 |
| 965 <1035 900 –1140 As rec | ieved | 30/35 | | ≤152 | 1070 >1070 >1140 No. 9 | | 15/20 | ≤ 320 ent No. 1 | 300 – 400 |
| 965 <1035 900 – 1140 As rec Tensile strength 1310 1210 | ieved | 30/35 | | ≤152 | 1070 > 1070 > 1140 No. 9 Tensile streng | | 15/20 | ≤ 320 ent No. 1 Tensile stre 1035 | 300 – 400 |
| 965 <1035 900 – 1140 As rec Tensile strength 1310 | ieved | 30/35 | | ≤ 152 | 1070 > 1070 > 1140 No. 9 Tensile streng 1520 | | 15/20 | ≤ 320 ent No. 1 Tensile stre | 300 – 400 |



795

15

Mechanical properties
The following properties are applicable to Nicrofer 7016 TiNb in the hot and cold formed, solution-treated or solution-treated

and precipitation-hardened condition, and the indicated size ranges. Material outside these size ranges (see availability) with agreed properties are subject to special enquiry.

| AMS | Heat- | Form | Dimensions | acting Starting | Strating St | Return Street | Annealed | Strating St | Retugai Chethan | | Street institution | Precipitation harde | ened | Mag Ting Ti |
|---------------------|--------------------|-----------------------|--|-----------------|---------------------|--|-------------------|-----------------------|--|-------------------------|----------------------|---------------------------|---|------------------------|
| The this may She th | treatment | | | | Tensile strength | 0.2 % Yield strength | Elongation | Brinell hardness | Grain size | Tensile strength | 0.2 % Yield strength | Elongation | Reduction of area | Brinell hardness |
| No. | No. | | mm | | N/mm² | N/mm² | A 5 % | HB | μm | N/mm² | N/mm² | A5 % | Z % | · HB |
| 5542 | 5 | Strip | active and | < 0.25 | 965 | retugned setugned | The The man | | as agr | | | The suited Sat The suited | S Starting mind | negation Sale Treating |
| | | Salley Line alley | 0.25 – | < 0.60 | 895 | | 20 | | ≤ 152 | 1070 | | | | >300 |
| | | | ≥ 0.60 | | as agreed | | as agreed | 1001 - 104 1001 - 201 | | | | | | |
| | | Sheet | 0.25 – | 0.60 | 965 | refin | 30 | Stretting St | | And I'm Salah | | | | |
| | | | > 0.60 - | 3.20 | 895 | 415 | Marinos Stratinos | | | Startings Startings | | | | |
| | | | > 3.20 - | 6.35 | 895 | 450 | 40 | | ue fin and Strating amore | | | | | |
| | | Plate | 4.75 – | 100 | | attingainst | | | udfingalici | | | | | |
| 5598 | 2 | Strip | Tinaging S. Tinaging | < 0.25 | 965 | Ting story S. | | | | | | | | |
| | | | 0.25 – | < 0.60 | 930 | | 18 | | ie, Andrei | | | | | |
| | | | ≥ 0.60 | | as agreed | Street . | | | The state of the s | | | | | |
| | | Sheet | 0.25 – | 0.60 | 930 | 515 | 30 | Strofing and | | The Tree and Stratues | | | | |
| | | | > 0.60- | 3.20 | 930 | 515 | 35 | And the same | ≤ 64 | 1170 | 795 | 18 | | > 315 |
| | | | > 3.20- | 6.35 | no' hearing | The limit | Tudano, | To the second | T Aller | | | | | |
| | | Plate | 4.75 – | 100 | | S. S | | 1 | as agreed | 1100 | 725 | 18 | | > 300 |
| 5667 | 4 Time Studie | Bar, forging | art. Study St | ≤100 | Stary St | ng, Stray | | ≤300 | | 1140 | 725 | 20 | 25 | 300 – 360 |
| | Stratus Strati | Strains" ST | attending to the same of the s | >100 | St. Lines. | and formally fraction of | Trad or | 2000 | | 1100 | 690 | 15 | . 17 | 300 - 300 |
| 5668 | Sures Sures Harris | Ring, bar, forging | The state of the s | ≤250 | Station in | | The hard That | | | 860 975 | 550 | 8 - 1 - 1 - 1 | 3 3 3 4 4 5 4 5 6 5 6 6 6 6 6 6 6 6 6 6 6 6 6 | 260 – 340 |
| 5669 | 2 | Bar | | < 60 | | State and | | | | | | 18 | 25 | 301 = 100° |
| Trefin's Shefti | The line Strate | Street S. | 60- | <100 | | again a | | | | 1170 | 795 | 15 Station | 20 | 315 – 400 |
| | Starting Jeets | and the same | ≥100 | e They are | Cheffin CA | | | | | as agreed | | atridania | | |
| 5670 | 2 | Bar, forging, | The and | < 60 | | | | | | | - Aratingalas | 18 | 18 | ing allow |
| Tuesdor | or first or first | ring | 60- | <100 | | | | | | 1170 | 795 | 15 | 15 | 300 – 400 |
| STORY STORY | Street Str. | | ≥100 | | | | 2 10 2 10 10 1 | | | as agreed | as agreed | | 3 3 3 1 3 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 | |
| 5671 | 2 | Bar, forging, | ≤ 60 | ong | | nest Arest | | | | 1170 | 795 | 18 | 18 | |
| Streeting Streeting | Studing" Chair | ring | Strains. | ransv. | | | | | | 1140 | 760 | 15 | 3 15 | 000 400 |
| | Small Strates | Carry Inc. 1800 | >60 - | 100 long | The Ludwig | | | | | 1170 | 795 | 15 Hating | 15 | 300 – 400 |
| Trains aller | | And Industry | u Tinguici Yu Tinguici t | ransv. | | | | | | 1100 | 725 | 12 | 12 | |
| Ting siles | Tuestic Service | | >100 | | | The sine s | 4142 2110.1 | | Liamo, Traine, | as agreed | as agreed | The alliest | The single | |
| 5747 | 2 | Bar, forging, | 4 STAR STAR | < 60 | Steen St. | | | < 220 | | 1170 | 795 | 18 | 18 | 200 200 |
| Marin State | | ring | 60- | <100 | | | | ≤320 | | 1170 | 795 | 15 | a 15 a a | 300 – 380 |
| | Shallinday Shall | | ≥100 | | The Troping | | Analing Shaling | Stratings" | Ralingui (Malingui | | Phalinday Ph | | The Those The T | |
| 5582 | 5 Tuesday | Tubing | < 3.20 OD s | | as agreed | | | | | Krelinganes | | | | |
| Tuggios Tuggi | | | ≥ 3.20 OD > | | 965 | 550 | 30/35 | | ≤152 | 1070 | 690 | 15/20 | | |
| 5698 | S THE SHIP ST | Spring wire | | ≤ 0.60 | <1035 | | | | | > 1070 | | | | |
| | | | > 0.60- | 12.7 | 900 – 1140 | | | | | >1140 | | | | |
| | | | | | As re | ecieved | | | | Ma O Staffins | | After heat treatme | | |
| | | | | | Tensile streng | th N/mm² | | | | No. 9 Tensile streng | ith N/mm² | | No. 1 Tensile stre | ength N/mm² |
| 5699 | see | Wire | > 0.3 - 6.35 | round | 1310 | at The allow | | | | Kue Ting illo | The Ting ing | | | |
| TeTrestics Tr | right | or the start | | square | 1210 | | | | | 1520 | | | 1035 | |
| | Start Start | | > 6.35 – | 10.6 | | | | | | 1380 | | | | |
| | | | > 10.6 - | 15.9 | 1100 | | | | | 1240 | | | 1000 | |
| Toble 40 MA | nimum mechanical p | roportion at room | action of the state of | | | | | | | The Lines | | STY OF THE ST | | |

Table 4a – Minimum mechanical properties at room temperature, metric values.

| AMS | Heat- | Form | Dimensions | | | | Annealed | | |
|----------------|--|-------------------------|----------------|-----------------------|-----------------------|--|---------------------------------|--|--|
| | treatment | Stating Stating | | | Tensile strength | 0.2 % Yield strength | Elongation . | Brinell hardness | Grain size |
| No. | No. | Stuffing allog Stuffing | inches | | ksi | ksi | A 5 % | HB | ASTMNo. |
| 5542 | 5 Justina 111 | Strip | | < 0.010 | 140 | and the said of | | And Industry | as agreed |
| | | The alley Sh | 0.010 - | < 0.025 | 130 | | 20 | | Zingalion Zing |
| | | | ≥ 0.025 | The State Control | as agreed | | as agreed | | Steel Steel |
| | | Sheet | 0.010 - | 0.024 | 140 | | 30 | | Starting Starting |
| | | | > 0.024 - | 0.125 | 130 | 60 | The appropriate the appropriate | | |
| | | | > 0.125 – | 0.250 | 130 | 65 | 40 | | |
| | | Plate | 0.187 – | 4.0 | | | | | Ting alici |
| 5598 | 2 | Strip | | < 0.010 | 140 | | | | as agreed |
| | | Stratus Stratus | 0.010 - | < 0.025 | 135 | | 18 | | a land |
| | | | ≥ 0.025 | | as agreed | | T. 14 allio | | Stating and Statin |
| | | Sheet | 0.010 - | 0.024 | 135 | 75 | 30 | | Tre Tingalion |
| | | Ting Siles | > 0.024 - | 0.125 | | | | | The siles |
| | | | > 0.125 – | 0.250 | 135 | 75 | 35 | Citae, | |
| | | Plate | 0.187 – | 4.0 | | | | 3 haline | as agreed |
| 5667 | State 4 State of the State of t | Bar, forging | S. Kastinganin | ≤ 4.0 | | | The same | | Stratus Stratus |
| Tue Ting giron | The three many | Tusting and Tusting | | > 4.0 | | and the said | | ≤ 300 | A CONTRACTOR OF THE PARTY OF TH |
| 5668 | Statistics Statistics | Ring, bar, forging | | ≤ 10.0 | The Ting siles | The state of the s | Transition of the same | STEE | eting " Etection |
| 5669 | 2 | Bar | | < 2.50 | Strating Strating | | | 3 | Strating Stratin |
| 2 tre tue and | Status in Status in | Strating and Strating | 2.50 – | < 4.0 | The tree dies. | Streft Str | Starting and | Strating 2 | Strat marini |
| | | | ≥4.0 | The This may | tuction tuction | Le Time and | Tar Ting men | - Traffing sheet | Lecting sheet |
| 5670 | 2 | Bar, forging, | - 1.0 | < 2.50 | The Same | | Tres and | Trus | The same of the |
| 0070 | Star Cha | ring | 2.50 - | < 4.0 | The Charles | San Sala | Trica Care, | Sec. | Star Star |
| | | Stration Stration | ≥4.0 | 14.0 Justin | Strating Strating | Station St. | | The state of the s | Strating Stratin |
| 5671 | 2 | Bar, forging, ring | ≤ 2.50 | long. | | | | College Industrial | The Time and Starting |
| | | | 2.50 - | 4.0 long. transv. | Status men Status | | The Bastine and | | |
| | | | >4.0 | alica Charl | Man Chan | and the same of the | | | Ares Ches |
| 5747 | 2 34 | Bar, forging, | | < 2.50 | Start and Sell ration | | | | Station State |
| | | ring | 2.50 - | < 4.0 | Malling mas | | Trights have | ≤ 320 | |
| | | Anethrasica, | ≥ 4.0 | The West Treeting men | | | | | |
| 5582 | 5 1100 | Tubing | < 0.125 OD | ≤ 0.015 s | as agreed | | | | Zingolioi Sir |
| er ener | Street Street | Strand Stran | ≥ 0.125 OD | >0.015s | 140 | 80 | 30/35 | | Start Charles |
| 5698 | 8 5 | Spring wire | Strike 32 | ≤ 0.025 | < 150 | Str. Line | The Stratus | | |
| Starting and | Quetuano, | Strating Strating | > 0.025 - | 0.50 | 130 – 165 | | The the sales | | |
| | | | Turking man | Thang 0.00 | Augustus | As receive | d's and a surfinger | | |
| | | | | | | | | | |
| E600 | The start of the start | Mino | 0.040 | 0.250 | | Tensile strength k | SI STATE | | |
| 5699 | see | Wire | 0.012 - | - 0.250 round | 190 | | | | |
| | right | | - 0.0F0 | 3, , | 175 | | | | |
| | | | > 0.250 - | 0.418 | 160 | | | | |
| | Fine sites | | > 0.418 – | 0.625 | | | Treaties | | |

Table 4b – Minimum mechanical properties at room temperature, imperial values.



| ZTreThermal | hethianics | rocipitation bard- | nd Stating | Mathania Shathania |
|------------------|------------------------------|-----------------------------------|-----------------|--------------------|
| Tensile | 0.2 % Yield | recipitation harden Elongation | ea Reduction | Brinell |
| strength | strength | Liorigation | of area | hardness |
| STrating S | LETING STRETING | A 5 | Z Strating | |
| ksi | ksi | % | % | HB |
| 150 | Tuzani | - The district | ating allest | The diller |
| 10033711 | Since Since | | | >300 |
| 155 | | 15 | | Starting of |
| 3 Tre Tres illin | te fine all Streeting all | | | |
| 165 | 105 | 20 | | >315 |
| They had | Ting and | The same | | Tursund |
| 155 | 100 | 20 | | |
| 155 | and 1000 Separations | 20 | | |
| 3 Tree I had | acting of the true of the | | | |
| 160 | | 12 | | >300 |
| Zinamoj S | | | | |
| 470 | 445 | 10 chief | | >24E |
| 170 | 115 | 18 | | >315 |
| 400 Kaitugain' | AND STRATEGIE | The Time and the Stratus | | transino, |
| 160 | 105 | 18 | a - rughingings | >300 |
| 165 | 105 | 20 | 25 | 300 – 360 |
| 160 | 100 | 15 | 17_tuetime | |
| 125 | 80 | 8 | 8 4 4 4 4 4 4 | 260 – 340 |
| 140 | | | | |
| 170 | 115 | 18 | 25 | 315 – 400 |
| 3r 3 | 30110 3410 | 15 | 20 | 300 |
| as agreed | | | | |
| 170 | 115 | 18 | 18 | 300 – 400 |
| 170 | | 15 | 15 | 400 |
| as agreed | as agreed | | | |
| 170 | 115 | 18 | 18 | |
| 165 | 110 | 15 | 15_344 | 300 – 400 |
| 170 | 115 | 15 | 15 | 300 – 400 |
| 160 | 105 | 12 | 12 | |
| as agreed | as agreed | | | Tuanga Tuanga |
| 470 | 445 | 18 | 18 | 200 200 |
| 170 | 115 | 15 | 15 at 10 2 | 300 – 380 |
| Strating and | | | E Kre They man | |
| Aug ing men | | | | |
| 155 | 100 | | | |
| >155 | en Street | | | |
| >165 | | | | |
| Zinatingain. | Walling all . The Line all . | After heat treatmer | nt Stating and | |
| No. 9 | (net in a pine) | | No. 1 | to the man |
| Tensile strength | n Ksi | | Tensile strengt | th ksi |
| 220 | | | 150 | |
| 2 Treling ST | | | Streting 8 | |
| 200 | | | 145 | |
| 180 | | | and the and | |



| AMS | Heat- treatment | Form | Dimensions | | Tensile strength | 0.2 % Yield strength | Annealed Elongation | Brinell hardness | Grain size | Tensile strength | 0.2 % Yield strength | Precipitation hard Elongation | Reduction of area | Brinell hardness |
|-------|---|-----------------------|------------------------|------------------------|---------------------|--|------------------------|--|--|---------------------|-------------------------|----------------------------------|-------------------|---------------------|
| No. | No. | | inches | | ksi | ksi | A 5 % | HB | ASTM No. | ksi | ksi | A5 % | Z % | HB |
| 5542 | 5 Tuethou | Strip | 3. Kua Tuanna | < 0.010 | 140 | Mari | as Tuestine in | - Kas Luciona) | as agreed | 150 | ne traines | Tas Tropinos | | tae Thomas |
| | | | 0.010- | < 0.025 | 130 | | 20 | | | 1EE (Tingula) | | A Finantial | | >300 |
| | | | ≥0.025 | | as agreed | | as agreed | | | 155 | | 15 | 300 | |
| | | Sheet | 0.010- | 0.024 | 140 | | 30 | | | | of Street | | Str. Str. | Jue Black |
| | | | >0.024- | 0.125 | 130 | 60 | is I was a Strait was | | | 165 | 105 | 20 | See July 3 | >315 |
| | | | > 0.125 – | 0.250 | 130 | 65 | 40 | | | and The Thing hine? | A Contract of | | Tartin Market | fuel and Estacting |
| | | Plate | 0.187 – | 4.0 | | | | | | 155 | 100 | 20 | 30° 1 (10°) | trafficalical |
| 5598 | 2 | Strip | | < 0.010 | 140 | | | | as agreed | 155 | 115 alice 4 | | | |
| | | | 0.010- | < 0.025 | 135 | | 18 | | Street Salari | 160 | 2 2 2 1 C | 12 | | >300 |
| | | | ≥0.025 | | as agreed | | istus Stating | | | Strating of | S. Tree Wood | Tank Start | | 7300 |
| | | Sheet | 0.010- | 0.024 | 135 | 75 | 30 | | tre Ting parce | Tueling | The Royal Comment | Treating week | Sand Ludani, | 10 m |
| | | | > 0.024 - | 0.125 | | | 35 | | Tingalog | 170 | 115 | 18 | Guiros Inglatos | >315 |
| | | | >0.125- | 0.250 | 135 | 75 | 30 3 | Se Marion | | and the same of | | Star Star. | 300 | |
| | | Plate | 0.187- | 4.0 | | | | Start 101 | as agreed | 160 | 105 | 18 | Trans. | >300 |
| 5667 | Staffing Staffing | Bar, forging | | ≤ 4.0 | | | | Stading h | Strating Brain | 165 | 105 | 20 | 25 | |
| | | The Tinguing Starting | | >4.0 | | The Strategic of the | | ≤300 | and the state of t | 160 | 100 | 15 | 17 | 300 – 360 |
| 5668 | Stating and | Ring, bar, | | ≤10.0 | Hacking men Hacking | Turk to the same of the same o | A Transmit | State of the state | acting " Stating | 125 | 80 | 8 345 | 8 4 4 4 4 4 | 260 – 340 |
| 6669 | 2 | forging Bar | | < 2.50 | Stratus may Stratus | The state of the s | | Con Threshort | Studing siles | 140 | Status . | 18 | 25 | Just Shall |
| 0009 | Z destroy and | A Dal | 2.50 – | < 4.0 | The Charles | The fire of the second | and the same of | Lactus and | The Ting aller | 170 | 115 | 15 | 20 | 315 – 400 |
| | | | ≥4.0 | 4.0 | ALIEN METHOD | d Gradulari | A second | of the and | a Ting alice | on agreed | | TIS THE STREET | 20 | |
| 670 | 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | Bar, forging, | 24.0 | < 2.50 | Same, Str. | 300 | Na alima | San Tree | Salary Che | as agreed | | 18 | 18 | |
| 3010 | Chart Char | ring | 2.50 – | < 4.0 | Sta, Sta, | | se Street | Sea, | Cha. | 170 | 115 | 15 | 15 | 300 - 400 |
| | | Stration Stration | ≥4.0 | 4.0 | Stating Stating | State of | San Carling | Talles . | Strafing L. Strafing | as agreed | as agreed | Strain Strain | Streling. | |
| 5671 | Staff 2 Staffard | Bar, forging, | ≤ 2.50 | long. | Status Status | A to the same | | S. W. Finder | | 170 | 115 | 18 | 18 | |
| JOT 1 | - Vacting day | ring | ≥ 2.50 | transv. | | Carrie Land | Marie Color | And The Suiter | | 165 | 110 | 15 The Tree Lines | 15 | |
| | | a San A San | 2.50 – | | | and the same | Ting for | | | 170 | 115 | 15 | 15 | 300 -400 |
| | | | 2.50 - | 4.0 long. transv. | Start Start | | The Street | | | 160 | 105 | 12 | 12 | |
| | | | >4.0 | Street and Street | Charles Charles | Samuel St. | | | | | | Streeting 12 | 12 | |
| 5747 | Stratus and Stratus and | Shefter | 24.0 24.0 | < 2.50 | That have | Market Lington | | | | as agreed | as agreed | 18 | 10 (40) | |
| 0141 | Zaction Zaction | Bar, forging, | 2.50 | Cho. | And Ting allow | | | ≤ 320 | | 170 | 115 | | 18 | 300 – 380 |
| | | ring 3400 | 2.50 − ≥4.0 | < 4.0 | | | | | | | | 315 Start | 15 | |
| Steel | E West Street | Tubias | <0.125 OD | < 0.01F a | She's She's | | | | | | | | | |
| 5582 | Stration Stration | Tubing | <0.125 OD ≥0.125 OD | ≤ 0.015 s > 0.015 s | as agreed 140 | 80 | 30/35 | | | 155 | 100 Strating | | | |
| 5698 | Strating and | Coring vales | 20.125 OD | > 0.015 s ≤ 0.025 | <150 | 30 OU | 30/33 | | | >155 | | | | |
| 2090 | Starting and Starting and | Spring wire | >0.025- | 0.50 | 130 – 165 | | | | | > 165 | | | | |
| | | | | | | ceived | | | | | | After heat treatm | nent | |
| | | | | | | | | | | No. 9 | | Tinggiles Ti | No. 1 | |
| | | | | | Tensile strengt | h ksi | | | | Tensile streng | th ksi | | Tensile stren | gth ksi |
| 5699 | see see | Wire | 0.012 - 0.250 |) round | 190 | | | | | 220 | | | 150 | |
| | right | | | square | 175 | | | | | ZZU ZZU | | | Streeting men | |
| | | | > 0.250 - | 0.418 | 160 | | | | | 200 | | | 145 (1103 1101 | |
| | | | > 0.418 – | 0.625 | 3,100 3,44 | | | | | 180 | | | 145 | |

Table 4b – Minimum mechanical properties at room temperature, imperial values.

Bending test for sheet in the solution-treated condition without cracking:

equal to the thickness up to 1.27 mm (0.05 in.) of twice the thickness > 1.27 to 6.35 mm (> 0.05 to 0.250 in.)

| Tagy Tagy | Carlot. | - Angli | and the same | 1. | | ich. | (ng) | May. | They | Calley. | - dieje | Calley. | They They |
|------------------|------------------------|--------------------|--------------|---------------------|-----------------------|---------------------|------|----------------|----------------|-----------|---------------------|-----------------------------|-------------------------|
| Form | Heat treat- ment | Testing tempera | ture | Tensile strength | Tuanga I Tuanga | 0.2 % Y strength | | Elong. A₅ | Stress | Station S | Stress rupt Time | ture values Elong. As | acc. to |
| ici | and Streeting | C° | F | N/mm² | ksi | N/mm² | ksi | % | N/mm² | lsi | h Ingalis | % | Strativaging Strativage |
| Bar, forg., ring | arion Jain | 730 | 1350 | | | | | | 360 | 52.5 | 23 | ≥5 | AMS 5668 |
| Bar, forgings | J. S. Lee | 730 | 1350 | | | | | | 310 | 45 | 100 | ≥5 | Anathama, Anatham |
| Forgings | | 820 | 1500 | | | | | | 260 | 38 | 100 | ≥5 | ASTM-B 637 |
| Rod, bar | 0 | 820 | 1500 | Cus. | | ELINO, S | | | 260 | 38 | 100 | ≥5 | |
| Tubing | 5 | 705 | 1300 | 1070 | 155 | 690 | 100 | 15/20 | | | | | Strating Strating |
| Tubing | 5 | 730 | 1350 | Wa zaprzy Zapa | Tubalica S. | refiled S | del. | Strating allow | 310 | 45 | ≥23 | | AMS 5582 |
| Sheet | The Street | Sallery Stray | Sulley Str. | 1140 | 165 | 725 | 105 | 20 | The short | The siles | S. Lind allo. | Street. | The start Start |
| Plate | 5 | 705 | 1300 | 1070 | 155 | 690 | 100 | 20 | | | | | AMS 5542 |
| Strip | | | | 1070 | 155 | 690 | 100 | 15 | ST STINS BIRST | | Collegator | | |

Table 5 – Minimum mechanical properties at elevated temperatures after precipitation hardening.

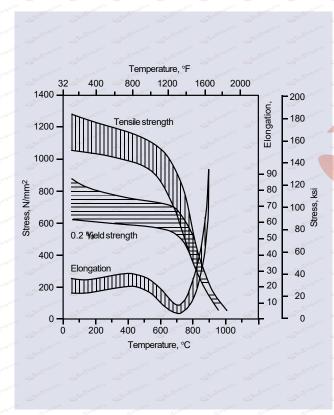


Fig. 1 – Typical short-time properties of different precipitation-hardened products at elevated temperatures.

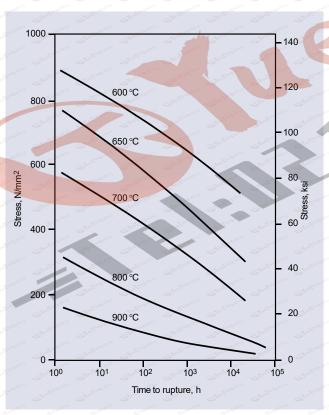


Fig. 2 – Typical high-temperature creep-rupture strength of bars after heat treatment No. 1.



7

Metallurgical structure

Nicrofer 7016 TiNb has an austenitic structure. The excellent mechanical strength results from precipitation hardening of the matrix gamma phase (γ) by formation of gamma prime (γ ') phase together with some carbides. By a double ageing heat treatment a dublex gamma prime (γ ') structure is formed. Several heat treatments are in use and are described in a special section, see Fig. 3 and Table 6 (°C) and Table 7 (°F).

Corrosion resistance

Nicrofer 7016 TiNb shows excellent general corrosion resistance at high and low temperatures and high resistance to stress-corrosion cracking. Oxidation resistance up to 980 $^{\circ}$ C (1800 $^{\circ}$ F) is remarkably high.

Applications

Due to its high temperature strength up to 820 °C (1500 °F) and its excellent corrosion resistance, Nicrofer 7016 TiNb finds a wide range of applications; for example:

- industrial and aircraft turbines
- rockets
- cryogenic purposes
- pressure vessels
- extrusion and forming tools
- nuclear reactors
- springs, bellows and bolts

Fabrication and heat treatment

Nicrofer 7016 TiNb can be hot and cold formed, joined and machined. Suitable equipment and forming in the solution treated condition are advantageous.

Heating

It is very important that the workpiece be clean and free from any contaminant before and during heating.

Nicrofer 7016 TiNb may become embrittled if heated in the presence of contaminants such as sulphur, phosphorus, lead and other low-melting-point metals. Sources of contamination include marking and temperature-indicating paints and crayons, lubricating grease and fluids, and fuels. Fuels must be low in sulphur; e.g. natural and liquefied petroleum gases should contain less than 0.1 % by mass and town gas 0.25 g/m³ maximum of sulphur. Fuel oils containing no more than 0.5 % by mass of sulphur are satisfactory.

Electric furnaces are desirable due to close control of temperature and freedom from contamination. Gas-fired furnaces are acceptable if impurities are at low levels.

The furnace atmosphere should be neutral to slightly reducing and must not fluctuate between oxidizing and reducing. Flame impingement on the metal must be avoided.

Hot working

Nicrofer 7016 TiNb may be hot-worked in the range 980 to 1200 °C (1800 to 2200 °F). Cooling should be by water quenching or as fast as possible. Localised reheating is not recommended.

Annealing after hot working is recommended to ensure maximum corrosion resistance.

For hot working, the material may be charged into the furnace at maximum working temperature.

During the final hot working with $\,$ min. 20 $\,$ % reduction the temperature must not exceed 1100 $\,$ °C (2000 $\,$ °F) to ensure high mechanical properties.

Cold working

Cold working should be carried out on solution-annealed material. Nicrofer 7016 TiNb has a much higher work-hardening rate than austenitic stainless steel and the forming equipment must be designed accordingly.

When cold working is performed, interstage annealing may become necessary.

Heat treatment

Various solution and ageing treatments are used to produce required properties. Long ageing times are necessary to develop optimum mechanical properties in Nicrofer 7016 TiNb.

For service up to 600 °C(1100 °F) with high tensile strength, direct ageing after forming or annealing is usual.

For optimum long-time properties, high creep and rupture strength and good oxidation resistance, a solution treatment followed by double ageing is recommended.

Typical heat-treatment combinations are given in Fig. 3, Table 6 (°C) and Table 7 (°F).

During any heating operation, the precautions outlined earlier regarding cleanlines must be observed.

Descaling

Oxides of Nicrofer 7016 TiNb and discoloration adjacent to welds, are more adherent than on stainless steels. Grinding with very fine abrasive belts or discs is recommended.

Before pickling in a nitric/hydrofluoric acid mixture, oxides must be broken up by grit-blasting or by pretreatment in a fused salt bath.

Machining

Nicrofer 7016TiNb should be machined in the annealed condition. The alloy's high work-hardening rate should be considered, i.e. only low surface cutting speeds are possible compared with low-alloyed standard austenitic stainless steel. Tools should be engaged at all times. Heavy feeds are important in getting below the work-hardened 'skin'.



Joining

The precipitation-hardening alloy Nicrofer 7016 TiNb can be welded by all conventional processes, including gas tungstenarc (GTAW/TIG), gas metal-arc (GMAW/MIG) and shielded metal-arc welding (SMAW/MMA). Low heat input is necessary.

Prior to welding, material should be in the annealed condition, clean and free from scale, grease, marking paints etc. Azone approximately 25 mm (1 in.) wide on each side of the joint should be ground to bright metal.

Interpass temperature should be 80 to max. 120 $^{\circ}$ C (175 to 250 $^{\circ}$ F).

Nicrofer 7016 TiNb should be annealed or solution treated prior to welding. A post-weld heat treatment is required before ageing.

For TIG and MIG welding the use of Nicrofer S 7020 alloy electrodes (W.-Nr. 2.4806, SG-NiCr20Nb, AWSA 5.14 ERNiCrFe-7), is mandatory.

For shielded metal-arc welding (MMA) the corresponding covered electrode (W.-Nr. 2.4648, EL-NiCr19Nb) is recommended.

For optimum corrosion resistance argon-arc welding, i.e. GTAWis preferred.

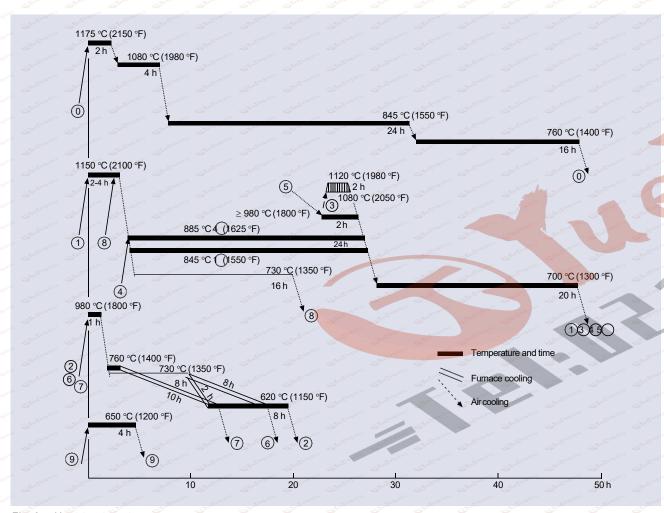


Fig. 3 – Heat-treatment combinations.



| Jus | The True of | The Ting and The Ting and | The This and The This and | The transfer of the sail | no all no all no all no all no all no all | Traffing and Traffing and | The The Street | tueTingain tueT |
|------|---|---------------------------|---------------------------|--------------------------|---|----------------------------------|--------------------|---------------------------------------|
| | No. | anneal | solution | equalise | stabilise | precipitation harden | accor | ding to |
| fino | The Line | Station Station | Challed and Challed and | Laging and Staging Stag | ng high | Etraling may | 7 CIVIS | A A A A A A A A A A A A A A A A A A A |
| | of O Traffing | 1175 °C2hAC | 1080 ℃4hAC | | 845 ℃24h AC | 760 ℃16h AC | B 637 | meling and |
| | "1 Streeting" | | 1150 ℃2 – 4h AC | | 845 ℃24h AC | 700 ℃ 20h AC | B 637 | 5668 |
| | 3 Station | | 1080 - 1120 °C2h AC | | | 700 ℃ 20h AC | B 637 | tre <u>tra</u> duna |
| | 4 | | | 885 ℃24hAC | | 700 ℃ 20h AC | Strating miles | 5667 |
| | Tagling | > 080°C | | | | 700 ℃20h ΔC | Street tradition S | 5542 5582 |
| | 8 Tuestings | | 1150 ℃15' | | | 730 °C 16h AC | - Chethalian | 5698 |
| | 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - | | 980 ℃~1hAC | | | 730 ℃8h FC2h to 620 ℃8h AC | B 637 | 5598 5669 |
| | | | | | | | | |
| | 6 Stution | | 980 °C 1h AC | | | 730 ℃8h FC10h to 620 ℃AC | Challing and | 5670 5671 5747 |
| | T Starting | | 980 ℃1h AC | | | 760 ℃1h FC 10hto 620 ℃AC | And Indition | Trading Start |
| | or 9 Streetings | | | | | 650 ℃4h | Strating most | 5699 |

Table 6 – Heat-treatment combinations Nos. 0 – 9 (\mathbb{C}°).

| Jus. | allord Ting off | or de Tradellor | ing The shap | The sailer | Indaged Trades | E. T. Marines | of ing in | TING THE REAL PROPERTY. |
|-------|-----------------|--------------------------|-----------------------|--|-----------------------------------|------------------------|-------------------|-------------------------|
| greo. | No. | anneal | solution | equalise | stabilise | precipitation harden | accor | ding to |
| lu S | And And | or Theories Shr | ici Tuagici Tuagici S | The other Star | ret _{elect} Areches Arek | | ASTM | AMS |
| | O Tuesting | 2150 °F2hAC | 1980 °F4hAC | the transmit | 1550 °F 24h AC | 1400 °F 16h AC | B 637 | Halling man |
| | JIC'1 STARTINGS | 24 Challind and Challing | 2100 °F 2 - 4h AC | Aug Tray and Tray and | 1550 °F 24h AC | 1300 °F 20h AC | B 637 | 5668 |
| | 3 Tuesting | | 1980 - 2050 °F 2h AC | and harden the state of the sta | nganot Startings of Startings | 1300 °F 20h AC | B 637 | an in the same of |
| | 4 Satuating of | | | 1625 °F24hAC | | 1300 °F 20h AC | - | 5667 |
| | L Starting in | > 12000€ | | Julius and Shell was Star | Transier Stratue | 1300 °F 20h ∆C | Ting sind | 5542 5582 |
| | 8 | | 2100 °F15' | | and the second second | 1350 °F 16h AC | Star Inguing | 5698 |
| | 2 Station | | 1800 °F~1hAC | The transmiss | industrial and a second | 1350 °F8h FC2h to | B 637 | 5598 |
| | Jan Z | | 1000 F TITAC | Harting men | The Try story | 1150 °F 8h AC | Streeting all | 5669 |
| | The Thousan | | 4000 °E45 AC | Harting and Shalling Shell | | 1350 °F8h | | 5670 |
| | 6 Stations | | 1800 °F1h AC | | | FC10h to 1150 °FAC | Starting 24 | 5671 5747 |
| | | | Stating Status | | | 1400 °F1h | | |
| | 7 Starting | | 1800 °F1h AC | | | FC10h to 1150 °F AC | Profit St | ue <u>tr</u> Stre |
| | 9 (10) | | | | | 1200 °F4h | - Tree True minor | 5699 |
| | | | | | | | | |

Table 7 – Heat-treatment combinations Nos. 0 – 9 (F°).



Availability

Nicrofer 7016 TiNb is available in the following standard mill product forms.

Sheet and plate

(for cut-to-length availability, refer to strip)

Conditions:

hot or cold rolled (hr, cr),

**depending on piece weight

solution treated or precipitation hardened and pickled

| Thickness mm | hr/cr | Width* | Length* |
|-----------------|-----------------------------|--------|---------|
| ≥ 1.20 - < 1.50 | Cr | 2000 | 6000 |
| ≥ 1.50 - < 6.0 | cr | 2000 | 5000 |
| ≥ 6.0 -<10.0 | Cr ^{Time} Strating | 2000 | 4000** |
| ≥ 6.0 -<10.0 | hr: 110 minst | 2000 | 4000** |
| ≥ 10.0 -< 20.0 | hr | 2000 | 2500** |
| ≥ 20.0* | hr | | |

| inches | The Line of the Line | inches | inches |
|--------------------------------------|-----------------------|--------|--------|
| ≥ 0.047 -< 0.060 | Tracting Strating | 80 | 240 |
| $\geq 0.060 - < 1/4$ | Cr. Charles Streeting | 80 | 240 |
| ≥ ¹ / ₄ | CL Tradency Maghin | 80 | 160** |
| ≥ 1/4 -< 3/8 | hr Three and Three | 80 | 160** |
| $\geq \frac{3}{8}$ $- < \frac{3}{4}$ | hr | 80 | 100** |
| ≥ 3/4* | hr Studio | | |
| *larger sizes subject to | special enquiry | | |

Discs and rings Conditions: hot rolled or forged, solution treated or precipitation hardened, pickled or machined

| Product | Weight kg | Thickness mm | O.D.* mm | I.D. mm |
|---------|-----------|-----------------|----------|--------------------|
| Disc | ≤ 2000 | ≤ 130 | ≤ 2000 | Tive men Streeting |
| Ring | ≤ 2000 | ≤200 | ≤ 2500 | on request |
| | | | | |
| Street. | lb Start | inches | inches | inches |
| | | | | |

≤ 5

≤8

≤ 80

≤ 100

on request

*larger sizes subject to special enquiry

≤ 4400

≤ 4400

Rod and bar Conditions: forged, rolled, drawn, solution treated or precipitation hardened, pickled, machined, peeled or ground

| é | Product | | forged* mm | rolled* mm | drawn* | | |
|---|----------|------|---------------|---------------|---------|--|--|
| | round | d | ≤200 | 15 – 75 | 12-65 | | |
| 9 | square | a 🖾 | 40 – 200 | 15 – 100 | 12-65 | | |
| | flat | Way | 40 - 80 | 5 - 20 | 10-20 | | |
| g | axb | | x 200 –600 | x 120 - 600 | x30-80 | | |
| 1 | hexagona | al s | 40 - 80 | 13 – 50 | 12 - 60 | | |

| 19 0000 | 100 mg | 1198 | . A.S. O |
|----------------------|--|-------------|---|
| Strell Stay | inches | inches | inches |
| round d | ≤8 | 5/8 -3 | 1/2-21/2 |
| square a | 15/8-8 | 5/8 -4 | 1/2-21/2 |
| flat axb | 1 ⁵ / ₈ -3 ¹ / ₈ X 8-24 | x = 5 -24 | 3/8 - 3/4 $\times 1^{1}/4 - 3^{1}/8$ |
| hexagonal s | 15/8 - 31/8 | 1/2 -2 | 1/2-23/8 |
| The setting a second | Marie Contraction of the Contrac | | |

*larger sizes subject to special enquiry

Forgings

Shapes other than discs, rings, rod and bar are subject to special enquiry.



Strip*
Conditions:
cold rolled,
solution treated and pickled or bright annealed**

| | Thickness mm | Width mm | re Tug mor | | Coil i.d. | tua _{anos} tua _{anos} | Etrafing men |
|----------|-----------------|-------------|---------------|-----|-----------|--|--------------|
| | 0.04 -≤ 0.10 | 30 – 120 | 100 | 300 | | | Ting allow |
| alici i | > 0.10 - ≤ 0.20 | 4-200 | A Black | 300 | 400 | | Sine, |
| | > 0.20 - ≤ 0.25 | 4-400 | | 300 | 400 | | |
| : | > 0.25 - ≤ 0.60 | 5 – 635 | | 300 | 400 | | |
| a allica | > 0.60 - ≤ 1.0 | 8 – 635 | Justing allos | | 400 | 500 | |
| Julia, | > 1.0 - ≤ 2.0 | 15 – 635 | | | 400 | 500 | 600 |
| a glici | > 2.0 – 3.0 | 25 – 635 | | | 400 | 500 | 600 |

| inches | inches | | inche | S | |
|-------------------|------------|----|-------|----|----|
| 0.0016 -≤ 0.004 | 1.20 – 5 4 | 12 | | | |
| > 0.004 -≤ 0.008 | 0.16 – 8 | 12 | 16 | | |
| > 0.008 - ≤ 0.010 | 0.16 – 16 | 12 | 16 | | |
| > 0.010 -≤ 0.024 | 0.20 - 25 | 12 | 16 | | |
| > 0.024 - ≤ 0.04 | 0.32 – 25 | | 16 | 20 | |
| > 0.04 -≤ 0.08 | 0.60 -25 | | 16 | 20 | 24 |
| > 0.08 - 0.12 | 1.0 -25 | | 16 | 20 | 24 |
| | | | | | |

*cut-to-length available in lengths from 500 to 3000 mm (20 to 120 in.) **maximum thickness 3.0 mm ($^{1/8}$ in.)

Wire

Conditions:

bright drawn, 1/4 hard to hard bright annealed

Dimensions

0.01-12.7 mm (0.0004-1/2 in.) diameter in coils, pail-packs, on spools and spiders

Welding filler metals

Suitable welding rods and wire are available in standard sizes.

Seamless tube and pipe

Using ThyssenKrupp VDM cast materials seamless tubes and pipes are produced and available from DMV STAINLESS SAS, Tour Neptune, F-92086 Paris, La Défense Cedex (Fax: +33-1-4796 8141; Tel.: +33-1-4796 8140; E-mail: dmv-hq@dmv-stainless.com).

Welded tube and pipe

Welded tubes and pipes are obtainable from qualified manufacturers using ThyssenKrupp VDMsemi-fabricated products.



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Disclaime

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