

**TIMETAL<sup>®</sup> 6-2-4-2****MEDIUM-STRENGTH, ELEVATED TEMPERATURE ALLOY**

TIMETAL 6-2-4-2 has an outstanding combination of tensile strength, creep strength, toughness, and high-temperature stability for long-term application at temperatures up to 1000°F (538°C). Its primary application is gas turbine compressor components such as blades, discs, and impellers. TIMETAL 6-2-4-2 is also used in sheet metal form for engine afterburner structure and for various hot airframe skin applications. For gaging and machining characteristics of TIMETAL 6-2-4-2 are very similar to TIMETAL<sup>®</sup> 6-4.

**TABLE 1****CHEMICAL COMPOSITION**

| ELEMENT                  | WEIGHT %  |        |
|--------------------------|-----------|--------|
|                          | Min.      | Max.   |
| Aluminum                 | 5.50      | 6.50   |
| Tin                      | 1.80      | 2.20   |
| Zirconium                | 3.60      | 4.40   |
| Molybdenum               | 1.80      | 2.20   |
| Silicon                  | 0.06      | 0.13   |
| Iron                     | —         | 0.25   |
| Oxygen                   | —         | 0.15   |
| Carbon                   | —         | 0.08   |
| Nitrogen                 | —         | 0.05   |
| Hydrogen                 | 0.010     | 0.0125 |
| Residual Elements, each  | —         | 0.10   |
| Residual Elements, total | —         | 0.40   |
| Titanium                 | Remainder |        |

**TABLE 2****PHYSICAL PROPERTIES**

| Property                                      | Value   | Value SI   |
|---|---|--|
| Density <sup>a</sup>                          | 0.164 lb in <sup>-3</sup>                                   | 4.54 g cm <sup>-3</sup>                                  |
| Beta Transus                                  | 1825°F + 25°F   | 995°C + 15°C   |
| Melting (liquidus) Point                      | ~3100°F   | ~1705°C  |
| Thermal Conductivity <sup>a</sup>             | 4.00 Btu hr <sup>-1</sup> ft <sup>-1</sup> °F <sup>-1</sup> | 6.92 W m <sup>-1</sup> K <sup>-1</sup>                   |
| Specific Heat Capacity <sup>a</sup>           | 0.110 Btu lb <sup>-1</sup> °F <sup>-1</sup>                 | 460 J kg <sup>-1</sup> K <sup>-1</sup>                   |
| Electrical Resistivity <sup>a</sup>           | 72.8-74.8 μΩ•in   | 1.85-1.90 μΩ•m   |
| Magnetic Permeability                         | Nonmagnetic   | Nonmagnetic  |
| Coefficient of Thermal Expansion <sup>b</sup> | 4.3 x 10 <sup>-6</sup> in in <sup>-1</sup> °F <sup>-1</sup> | 7.7 x 10 <sup>-6</sup> mm <sup>-1</sup> °C <sup>-1</sup> |
| Modulus of Elasticity                         | 16.5 Msi  | 114 GPa  |

<sup>a</sup> Typical values at room temperature of about 68-78°F (20-25°C)

<sup>b</sup> Mean coefficient from 32-212°F (0-100°C)

**TABLE 3****GENERAL FABRICATION AND HEAT TREATMENTS**

|                      |   |
|----------------------|---|
| Weldability          | Fair  |
| Forging              | Rough: 1900-1950°F (1038-1066°C), Finish: 1750-1800°F (954-982°C) |
| Stress Relief Anneal | 900-1200°F (482-649°C), 1-4hrs, Air Cool                          |
| Mill Anneal          | 1300-1550°F (704-843°C), Air Cool                                 |
| Solution Treatment   | 25-50°F (15-30°C) below beta transus, 1hr, Water Quench           |
| Aging                | 1000-1100°F (538-593°C), 8hrs, Air Cool                           |

**TABLE 4****HEAT TREATMENTS FOR SHEET**

| Treatment          | Temperature<br>°F (°C) | Time<br>Hours | Cooling<br>Method |
|--------------------|------------------------|---------------|-------------------|
| Duplex Anneal(DA)  |                        |               |                   |
| 1st stage          | 1650 (900)             | —             | Air Cool          |
| 2nd stage          | 1450 (785)             | —             | Air Cool          |
| Triplex Anneal(TA) |                        |               |                   |
| 1st stage          | 1650 (900)             | 2             | Air Cool          |
| 2nd stage          | 1450 (785)             | —             | Air Cool          |
| 3rd stage          | 1100 (595)             | 2             | Air Cool          |

**TABLE 5****HEAT TREATMENTS FOR BAR AND FORGINGS**

| Treatment<br>in (mm)  | Temperature<br>°F (°C) | Time<br>Hours | Cooling<br>Method |
|-----------------------|------------------------|---------------|-------------------|
| Sections < 2.5 (63.5) |                        |               |                   |
| Anneal                | 1750 (955)             | 1             | Air Cool          |
| Stabilization         | 1100 (595)             | 8             | Air Cool          |
| Sections < 2.5 (63.5) |                        |               |                   |
| Anneal                | 1650 (900)             | 1             | Air Cool          |
| Stabilization         | 1100 (595)             | 8             | Air Cool          |



TABLE 6

TYPICAL TENSILE PROPERTIES

HEAT TREATED AT 1778°F (970°C)/1h/AC + 1100°F (595°C)/8h/AC

| Temperature<br>°F (°C) | Rod Diameter<br>in (mm) | 0.2% YS<br>ksi (MPa) | UTS<br>ksi (MPa) | Elongation on 4D<br>% | Reduction in Area<br>% |
|------------------------|-------------------------|----------------------|------------------|-----------------------|------------------------|
| 68 (20)                | 1.50 (38)               | 130 (895)            | 146 (1004)       | 19                    | 42                     |
|                        | 1.10 (28)               | 130 (895)            | 148 (1018)       | 19                    | 44                     |
|                        | 0.71 (18)               | 139 (955)            | 104 (1045)       | 18                    | 40                     |
| 896 (480)              | 1.50 (38)               | 79 (545)             | 104 (716)        | 26                    | 63                     |
|                        | 1.10 (28)               | 81 (557)             | 105 (723)        | 27                    | 65                     |
|                        | 0.71 (18)               | 82 (565)             | 107 (735)        | 25                    | 67                     |

TABLE 7

CREEP AND POST CREEP TENSILE PROPERTIES

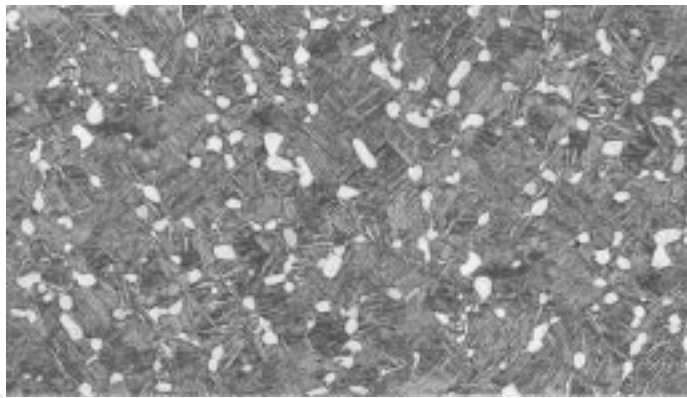
α + β HEAT TREATMENT, AIR COOLED AND AGED

| Temperature<br>°F (°C) | Creep Properties    |               |                           | Post Creep Tensile at Room Temperature |                  |                 |                        |
|------------------------|---------------------|---------------|---------------------------|--|------------------|-----------------|------------------------|
|                        | Stress<br>ksi (MPa) | Time<br>hours | Total Plastic<br>Strain % | 0.2% YS<br>ksi (MPa)                   | UTS<br>ksi (MPa) | Elongation<br>% | Reduction<br>in Area % |
| 842 (450)              | 56 (100)            | 100           | 0.066                     | 138 (951)                              | 151 (1038)       | 19              | 37                     |
|                        |                     | 300           | 0.109                     |  |                  |                 |                        |
| 932 (500)              | 44 (300)            | 100           | 0.060                     | 138 (951)                              | 151 (1038)       | 18              | 39                     |
|                        |                     | 300           | 0.125                     |  |                  |                 |                        |
| 1004 (540)             | 25 (170)            | 100           | 0.178                     |  |                  |                 |                        |

FIGURE 1

TYPICAL

TIMETAL 6242 (200X)



The data and other information contained herein are derived from a variety of sources which TIMET believes are reliable. Because it is not possible to anticipate specific uses and operating conditions, TIMET urges you to consult with our technical service personnel on your particular applications.

For more information, please contact the TIMET Sales Office/Service Center nearest you, TIMET's Technical Laboratories or TIMET's Website @ [www.timet.com](http://www.timet.com)

NORTH AMERICA

|               |              |
|---------------|--------------|
| Hartford, CT  | 860-627-7051 |
| Toronto, OH   | 740-537-5600 |
| St. Louis, MO | 800-753-1550 |
| Dallas, TX    | 817-329-5035 |
| Tustin, CA    | 714-573-1000 |

EUROPE

|                     |                  |
|---------------------|------------------|
| Birmingham, England | 44-121-356-1155  |
| Savoie, France      | 33-4-79-89-73-73 |
| Düsseldorf, Germany | 49-211-230-880   |

TECHNICAL SUPPORT

|                     |                 |
|---------------------|-----------------|
| Henderson, NV       | 702-566-4416    |
| Birmingham, England | 44-121-332-5381 |



First in Titanium Worldwide

