# NONFERROUS ALLOYS

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

2618

1. GENERAL

The 2618 aluminum alloy is a wrought alloy which responds to an age-hardening heat treatment. This alloy, originally developed for forging applications, has been used primarily in this form in the aircraft industry. It exhibits medium strength and ductility, fair resistance to general corrosion, and has good elevated temperature properties. Optimum composition and heat treating methods promote a high resistance to intercrystalline corrosion. The formability and machinability of the alloy are good.
Room temperature strength of this alloy is better than 2014-T6 but slightly lower than 7075-T6.
The 2618 alloy is presently used for large aircraft engine components and compressor blades. It is being considered for structural applications in supersonic aircraft as forged gas-turbine engine impellers, spacer rings, pistons and structural forgings. This alloy is available in wrought forms (1)(2)(8)(15).

1.01 Commercial Designation
Al 2618

1.02 Alternate Designations
Hiduminium RR, 58 (British)
AU2GN (French)

1.03 Specifications
1.031 Foreign, British Aircraft DTD 5070A
1.032 AMS and Federal Specifications, Table 1.032.

TABLE 1.032

| AMS | Form | Federal |
|---|---|---|
| 4132A | Die forgings, rolled rings, hand forgings, and forging stock (Condition T61) | QQ-A-367 |

1.04 Composition
Table 1.04

TABLE 1.04

| Source | (1)(5) | |
|---|---|---|
| | Percent | |
| | Min | Max |
| Copper | 1.9 | 2.7 |
| Iron | 0.9 | 1.3 |
| Magnesium | 1.3 | 1.8 |
| Nickel | 0.9 | 1.2 |
| Silicon | - | 0.25 |
| Titanium | 0.04 | 0.10 |
| Other | - | |
| Each | - | 0.05 |
| Total | | 0.15 |
| Aluminum | Balance | |

1.05 Heat Treatment
1.051 All forms. Anneal 775F, 2 to 3 hours, furnace cool 50F per hour to 500F, air cool (5).
1.052 Forgings and rolled rings.
1.0521 Solution treatment, 975 to 995F, hold for 6 hours minimum at temperature, boiling water quench (BWQ) to age condition T4 (1)(5).
1.0522 Age condition T4 385 to 395F, 20 hours to condition T61, (4)(5).
1.053 Sheet (DTD 5070A).
1.0531 Solution treatment and age. 975 to 985F, hold for 5 minutes to 1 hour at temperature (depending on gauge), cold water quench:
Age 365 to 385F, 10 to 30 hours (12). Sheet should be quenched in water not exceeding 104F and sheet 0.028 inch thick or less should only be solution treated once (2).

1.06 Hardness

1.07 Forms and Conditions Available
1.071 This alloy has been available in the past in all wrought forms, such as clad and unclad sheet, plates, extrusions, and forgings (2)(8). Current producer production is generally limited to forging forms (1)(4).

1.08 Melting and Casting Practice

1.09 Special Considerations

2. PHYSICAL AND CHEMICAL PROPERTIES

2.01 Thermal Properties
2.011 Melting range.
2.012 Phase changes.
2.0121 Time-temperature-transformation diagrams.
2.013 Thermal conductivity. 82.1 Btu ft per (hr sq ft F) (2).
2.014 Thermal expansion. Figure 2.014.
2.015 Specific heat. 0.22 Btu per (lb F) (2).
2.016 Thermal diffusivity.

2.02 Other Physical Properties
2.021 Density. 0.0999 lb per cu in 2.76 gr per cu cm (2).
2.022 Electrical properties:
Condition O 1.44 microhm-inch at RT
Condition T61 2.60 microhm-inch at RT
2.023 Magnetic properties. This alloy is non-magnetic.
2.024 Emissivity.
2.025 Damping capacity.

2.03 Chemical Properties
2.031 Tests on 2618-T61 forging material indicate the alloy is susceptible to stress corrosion cracking in the transverse grain directions. Longitudinal bend specimens stressed to 75 percent of their yield strength did not fail after 12 weeks of alternate immersion testing in 3 1/2 percent NaCl solution, 10 minute immersion and 50 minute air dry. However, approximately half of the long transverse specimens stressed to 75 percent yield strength failed over the time period of 4 to 8 days while the remainder did not fail within the 12 week period, and all the short transverse specimens stressed to 75 percent yield strength failed over the period of 4 to 20 days (17).

| | |
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2.04 Nuclear Properties

3. MECHANICAL PROPERTIES

3.01 Specified Mechanical Properties

3.011 AMS specified mechanical properties, Table 3.011.

TABLE 3.011

| Source | (1) | | | | |
|---|---|---|---|---|---|
| Alloy | Al-2.5Cu-1.5Mg-1.2Ni-1.0Fe-0.2Si-0.1Ti | | | | |
| Condition | T61 | | | | |
| Form | Die Forgings (≤4 In) | | | Rolled Rings (≤4 In) | |
| | From Stock (a) | From Forgings | | | |
| | | L | T | Tangential | Axial |
| $F_{tu}$ (min) - Ksi | 58 | 58 | 55 | 55 | 55 |
| $F_{ty}$ (min) - Ksi | 48 | 48 | 45 | 41 | 44 |
| e (4D) (min) - Percent | 6 | 4 | 4(b) | 6 | 5 |
| Hardness (min) BHN (500 Kg), (10 mm ball) | 115 | 115 | | | |

(a) Stock representative of the forging

(b) Diameter > 0.25 with axis in plane parallel to parting plane

3.012 Producer's guaranteed mechanical properties, Table 3.012.

TABLE 3.012

| Source | (5) | | | | |
|---|---|---|---|---|---|
| Alloy | Al-2.5Cu-1.5Mg-1.2Ni-1.0Fe-0.2Si-0.1Ti | | | | |
| Condition | T61 | | | | |
| Form | Hand Forgings ≤ 16 square inch section | | | Rolled Rings ≤ 2 1/2 inch radial thickness | |
| Direction | L | LT | ST | Tangential | Axial |
| $F_{tu}$ (min) - Ksi | 58 | 55 | 52 | 55 | 55 |
| $F_{ty}$ (min) - Ksi | 45 | 42 | 42 | 41 | 41 |
| e(4D) (min) Percent | 7 | 5 | 4 | 6 | 5 |

3.02 Mechanical Properties at Room Temperature

3.021 Tension.

3.0211 Stress strain diagrams, see 3.0311.

3.0212 Tensile properties of clad sheet, Table 3.0212.

TABLE 3.0212

| Source | (2) | |
|---|---|---|
| Alloy | Al-2.5Cu-1.5Mg-1.2Ni-1.0Fe-0.2Si-0.1Ti | |
| Form | Clad Sheet | |
| Condition | CR + 977 to 995F, 1 Hr, WQ (Cold), flattened + 392F, 20 Hr | |
| Direction | T | L |
| $F_{tu}$, -ksi | 57.5 | 58.0 |
| $F_{ty}$, (0.1 percent)-ksi | 49.0 | 50.5 |
| e (2 in)-percent | 6.0 | 7.0 |
| E, $10^3$ ksi | 10.5 | 10.5 |

3.0213 Effect of exposure time and temperature on room temperature tensile properties of forged bar, Figure 3.0213.

3.0214 Effect of elevated temperature exposure and exposure time on tensile properties of forging, Figure 3.0214.

3.022 Compression.

3.0221 Stress-strain curve for clad sheet in compression, Figure 3.0221.

3.0222 Compressive properties of clad sheet, Table 3.0222.

TABLE 3.0222

| Source | (2) | |
|---|---|---|
| Alloy | Al-2.5Cu-1.5Mg-1.2Ni-1.0Fe-0.2Si-0.1Ti | |
| Form | Clad Sheet | |
| Condition | CR + 986F, 1 Hr, WQ (Cold); Flattened + 392F, 20 Hr | |
| Direction | T | L |
| $F_{cy}$, (0.1 percent) ksi | 52.0 | 51.0 |
| (0.3 percent) ksi | 53.5 | 53.0 |
| $E_c$, $10^3$ x ksi | 10.5 | 10.5 |

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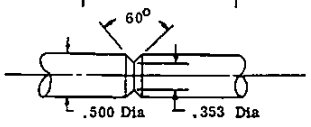
3.023 Impact.
3.024 Bending.
3.025 Torsion and shear.
3.0251 Effect of thickness and heat treatment on shear stress of forged bar, Figure 3.0251.
3.0252 Effect of thickness and heat treatment on shear stress of forged bar, Figure 3.0252.
3.026 Bearing, see 3.036.
3.027 Stress concentration.
3.0271 Notch properties.
3.02711 Effect of specimen cross section location on sharp notch strength ratio of forged alloy, Figure 3.02711.
3.02712 Typical notch strength properties of alloy plate, Table 3.02712.

TABLE 3.02712

| Source | (18) | |
|---|---|---|
| Alloy | Al-2.5Cu-1.5Mg-1.2Ni-1.0Fe-0.2Si-0.1Ti | |
| Form | Plate | |
| Nominal Thickness | 1.356 | |
| Condition | 2618-T651 | |
| Direction | L | T |
| $F_{tu}$ - Ksi | 62.4 | 61.1 |
| $F_{ty}$ - Ksi | 57.6 | 54.6 |
| Notch Strength | 81.2 | 83.2 |




Notch-Root Radius $\leq$ 0.0005, $K_t \geq$ 16

3.0272 Fracture toughness.
3.028 Combined properties.

3.03 Mechanical Properties at Various Temperatures
3.031 Tension.
3.0311 Stress-strain diagrams.
3.03111 Stress-strain curves at elevated temperature for clad sheet, Figure 3.03111.
3.03112 Typical tensile stress-strain curves at elevated temperature for several forgings, Figure 3.03112.
3.0312 Clad sheet.
3.03121 Effect of elevated temperature and short exposure time on tensile properties of clad sheet, Figure 3.03121.
3.03122 Effect of elevated test temperature and exposure time on tensile properties of clad sheet, Figure 3.03122.
3.03123 Effect of elevated test temperature and exposure time on tensile properties of clad sheet, Figure 3.03123.
3.03124 Effect of test temperature on tensile properties of clad sheet, Figure 3.03124.
3.0313 Extruded bar.
3.03131 Effect of test temperature on tensile properties of extruded bar, Figure 3.03131.
3.0314 Forgings.
3.03141 Effect of test temperature on average tensile properties of several forgings, Figure 3.03141.
3.03142 Effect of elevated test temperature and exposure time on tensile properties of forging, Figure 3.03142.
3.03143 Effect of elevated temperature on tensile properties of hand forged billets, Figure 3.03143.
3.03144 Typical tensile properties of forging at various temperatures, Figure 3.03144.
3.0315 Bar.
3.03151 Effect of elevated temperatures and exposure time on tensile properties of bar, Figure 3.03151.
3.032 Compression.
3.0321 Stress-strain diagrams.
3.03211 Typical compressive stress-strain curves at elevated temperature for several forgings, Figure 3.03211.
3.0322 Effect of elevated temperature on average compressive yield properties of several forgings, Figure 3.0322.
3.0323 Effect of elevated temperature and exposure time on compressive yield properties of forgings, Figure 3.0323.
3.033 Impact.
3.034 Bending.
3.035 Torsion and shear.
3.0351 Effect of elevated temperature on average shear strength of several forgings, Figure 3.0351.
3.036 Bearing.
3.0361 Effect of elevated temperature on average bearing properties of several forgings, Figure 3.0361.
3.037 Stress concentration.
3.0371 Notch properties.
3.03711 Crack strength of clad sheet at -110, 80 and 250F for various crack lengths, Figure 3.03711.
3.03712 Elevated temperature sharp notch strength ratio of forging for various cross-section locations, Figure 3.03712.
3.0372 Fracture toughness.
3.038 Combined properties.

3.04 Creep and Creep Rupture Properties
3.041 Creep curves for clad sheet at elevated temperature, Figure 3.041.
3.042 Creep and creep rupture curves for rod at elevated temperatures, Figure 3.042.
3.043 Creep and creep rupture curves for bar at 400 and 600F, Figure 3.043.
3.044 Creep and creep rupture curves for forged bar at elevated temperatures, Figure 3.044.
3.045 Creep and creep rupture curves for forging at elevated temperatures, Figure 3.045.

3.05 Fatigue Properties
3.051 Sheet.
3.052 Extruded bar.
3.053 Forging.
3.0531 Axial load fatigue strength for smooth longitudinal specimens from several forged billets, Figure 3.0531.
3.0532 Axial load fatigue strength for smooth long-transverse specimens from several forged billets, Figure 3.0532.
3.0533 Axial load fatigue strength for notched longitudinal specimens from several forged billets, Figure 3.0534.
3.0534 Axial load fatigue strength for notched long-transverse specimens from several forged billets, Figure 3.0535.
3.0535 Rotating beam fatigue strength for smooth and notched longitudinal specimens from forged billets, Figure 3.0535.
3.0536 Rotating beam fatigue strength for smooth and notched longitudinal specimens from forged billets, Figure 3.0536.
3.0537 Rotating beam fatigue strength for smooth and notched longitudinal specimens from forged billet tested at 250F, Figure 3.0537.
3.0538 Rotating beam fatigue strength for smooth and notched longitudinal specimens from forged billets tested at 400F, Figure 3.0538.

3.06 Elastic Properties
3.061 Poisson's ratio, 0.35 (2).
3.062 Modulus of elasticity, see Tables 3.0212 and 3.0222.
3.0621 Modulus of elasticity at room and elevated temperature for forged bar, Figure 3.0621.
3.0622 Effect of test temperature on modulus of elasticity in compression, Figure 3.0622.

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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4. FABRICATION

4.01 Formability

4.011 The alloy has good formability.

4.012 Hot forging. 970F and then forge within the temperature range of 970 to 900F down to 660F.

4.013 Cold work. All cold work should be done in the annealed or solution treated condition (2).

4.02 Machining

4.021 The machinability of this alloy is good and best results are obtained in the fully aged condition. Care must be taken if the alloy is machined in the quenched or annealed condition. Because of its softness in this condition it has a tendency to build up on the cutting edges. High carbon steel tools are recommended at low speeds and give a satisfactory result, while high speed steel should be used for large scale operations (2).

4.022 For continuous cuts, free from vibrations, single point turning tools of plain high carbon or high speed steel should be ground to:

| | |
|---|---|
| 35 to 80 degree | cutting angle, |
| 30 to 53 degree | top rake, |
| 7 to 10 degree | front clearance, |
| 10 to 20 degree | side rake, |
| 7 to 10 degree | side clearance. |

Cemented carbide tipped tools should be ground to:

| | |
|---|---|
| 60 to 80 degree | cutting angle, |
| 5 to 30 degree | top rake, |
| 6 to 10 degree | front clearance, |
| 5 to 10 degree | side rake, |
| 6 to 10 degree | side clearance. |

High speed steel milling cutters should be ground to:

| | |
|---|---|
| 50 to 60 degree | cutting angle, |
| 25 to 35 degree | top rake, |
| 3 to 7 degree | primary clearance, |
| 7 to 12 degree | secondary angle, |
| 10 to 50 degree | helix, and coarse tooth spacing (2) |

4.023 More detailed machinability information can be obtained from the Air Force Machinability Data Center-Area Telephone Code 513-271-9510.

4.03 Welding

4.031 Al 2618 is weldable with special techniques. It is unsuited for fusion welding, but can be resistance welded (2,7).

4.04 Heat Treatment

4.05 Surface Treatment

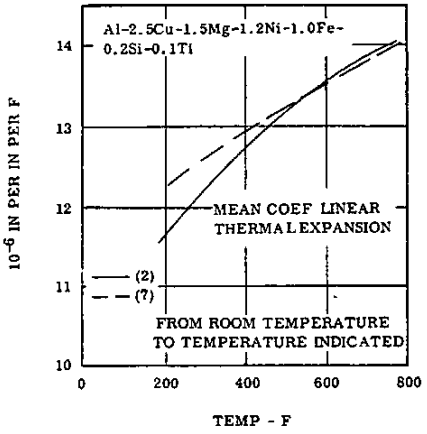


FIG. 2.014 THERMAL EXPANSION (2)(7)

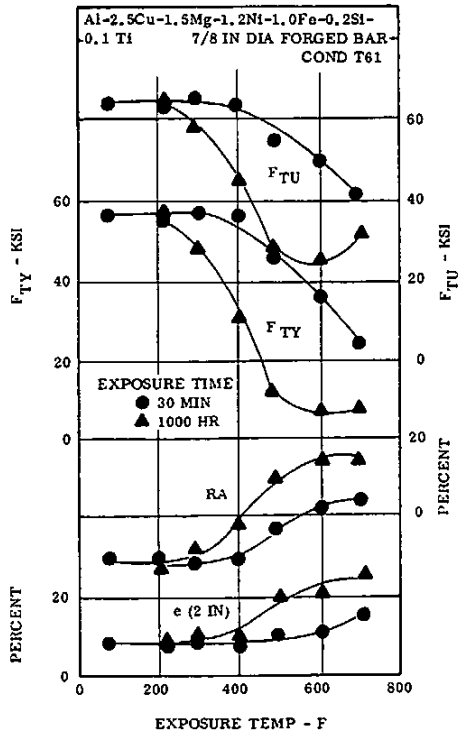


FIG. 3.0213 EFFECT OF EXPOSURE TIME AND TEMPERATURE ON ROOM TEMPERATURE TENSILE PROPERTIES OF FORGED BAR. (13)

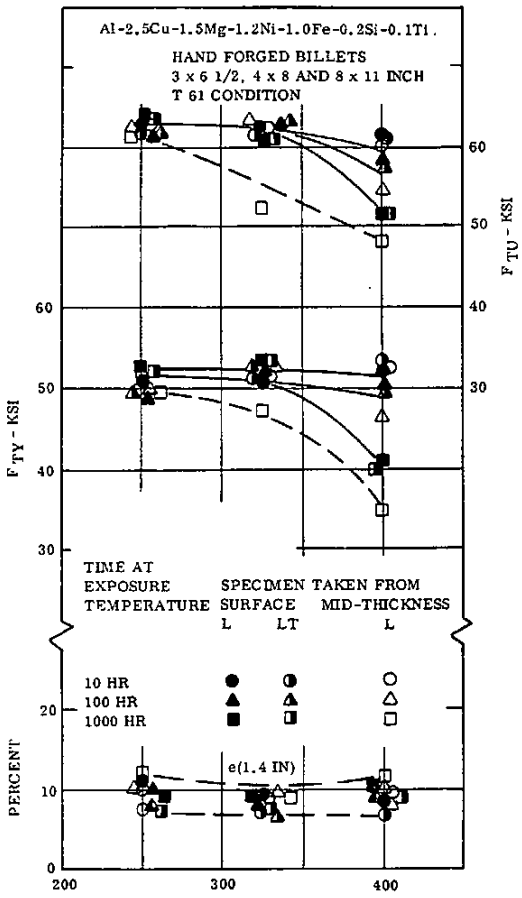


FIG. 3.0214 EFFECT OF ELEVATED TEMPERATURE EXPOSURE AND EXPOSURE TIME ON TENSILE PROPERTIES OF FORGINGS. (17)

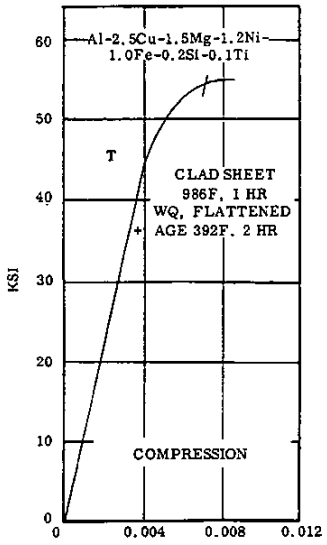


FIG. 3.0221 STRESS-STRAIN CURVE FOR CLAD SHEET IN COMPRESSION (7, p. 55)

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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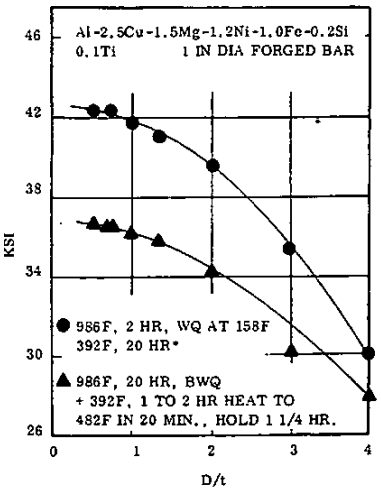


FIG. 3.0251 EFFECT OF THICKNESS AND HEAT TREATMENT ON SHEAR STRESS OF FORGED BAR (7, p. 20)

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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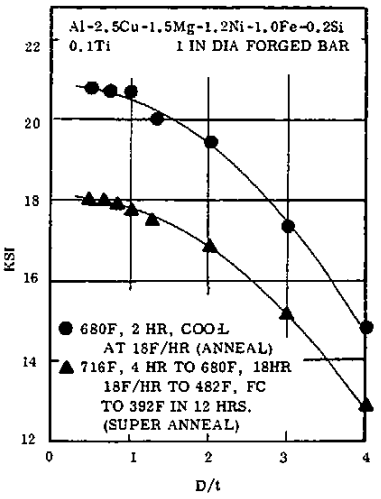


FIG. 3.0252 EFFECT OF THICKNESS AND HEAT TREATMENT ON SHEAR STRESS OF FORGED BAR (7, p. 21,22)

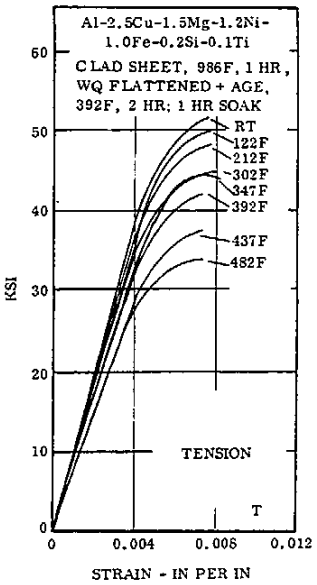


FIG. 3.03111 STRESS-STRAIN CURVES AT ELEVATED TEMPERATURES FOR CLAD SHEET (7, p. 53, 54)

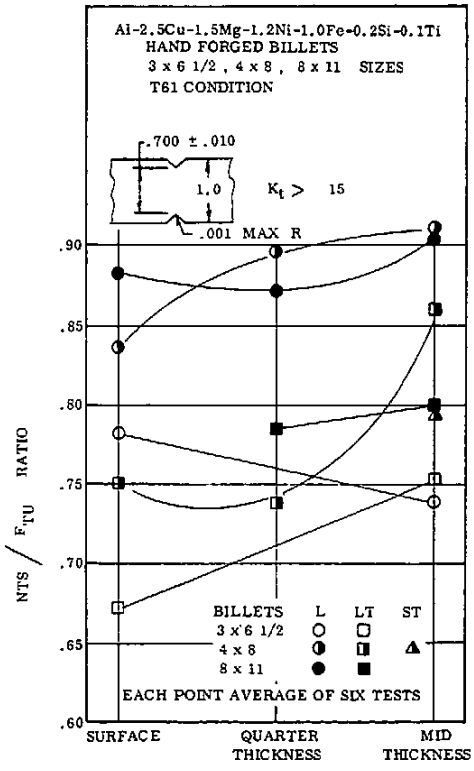


FIG. 3.02711 EFFECT OF SPECIMEN CROSS-SECTION LOCATION ON SHARP NOTCH STRENGTH RATIO OF FORGING. (17)

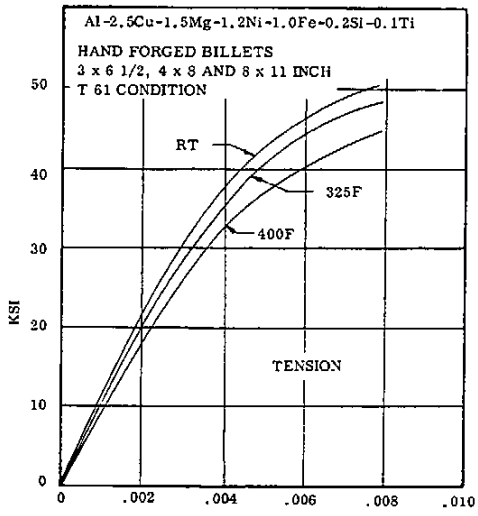


FIG. 3.03112 TYPICAL TENSILE STRESS-STRAIN CURVES AT ELEVATED TEMPERATURE FOR SEVERAL FORGINGS. (17)

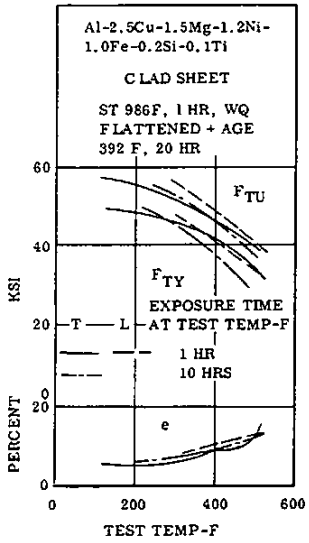


FIG. 3.03121 EFFECT OF ELEVATED TEMPERATURE AND SHORT EXPOSURE TIME ON TENSILE PROPERTIES OF CLAD SHEET (7, p.47, 148)

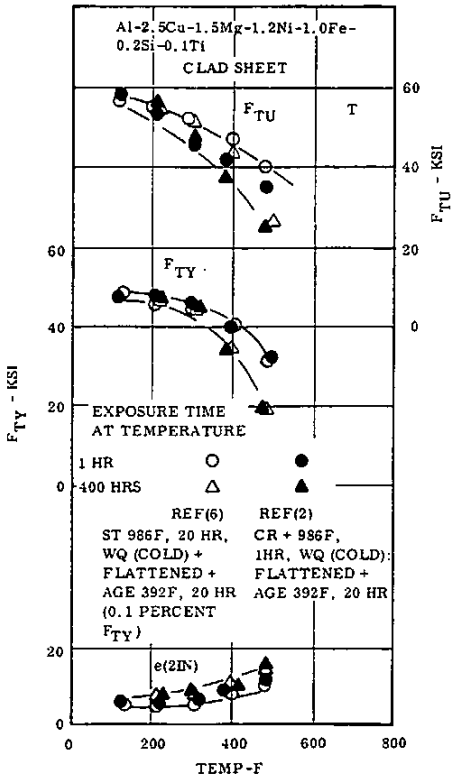


FIG. 3.03122 EFFECT OF ELEVATED TEST TEMPERATURE AND EXPOSURE TIME ON TENSILE PROPERTIES OF CLAD SHEET. (2)(6)

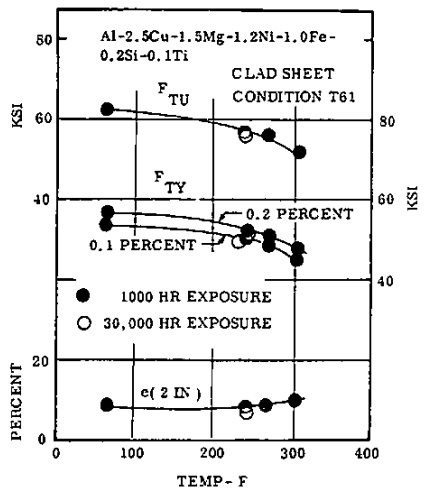


FIG. 3.03123 EFFECT OF ELEVATED TEST TEMPERATURE AND LONG EXPOSURE TIME ON TENSILE PROPERTIES OF CLAD SHEET. (8)

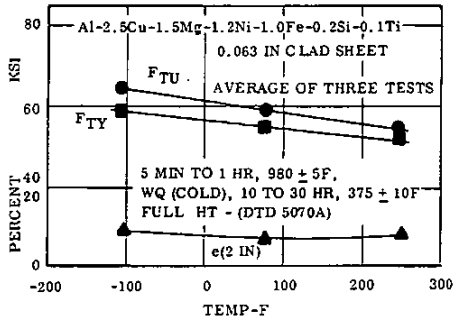


FIG. 3.03124 EFFECT OF TEST TEMPERATURE ON TENSILE PROPERTIES OF CLAD SHEET (12)

| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
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| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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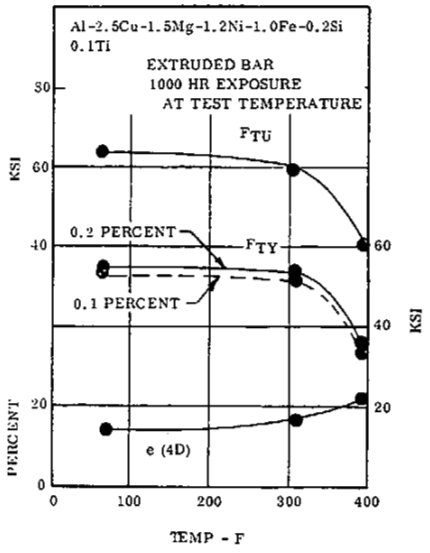


FIG. 3.03131 EFFECT OF TEST TEMPERATURE ON TENSILE PROPERTIES OF EXTRUDED BAR. (8)

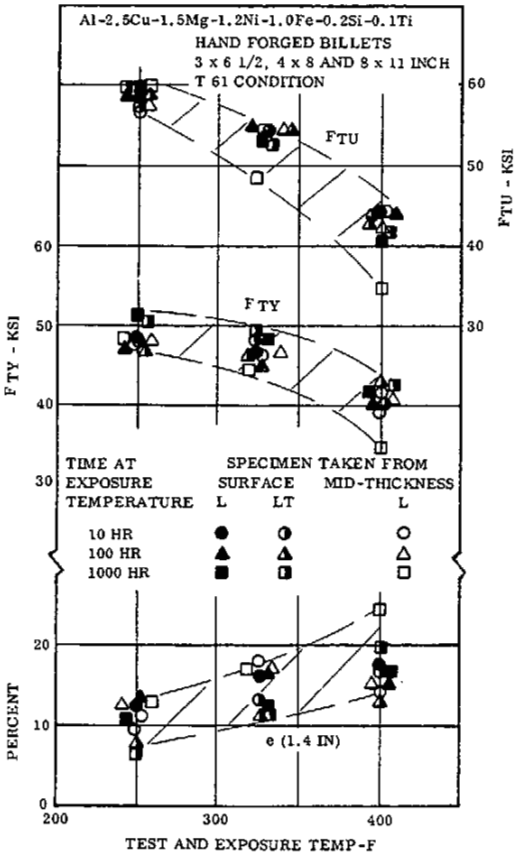


FIG. 3.03142 EFFECT OF ELEVATED TEST TEMPERATURE AND EXPOSURE TIME ON TENSILE PROPERTIES OF FORGINGS. (17)

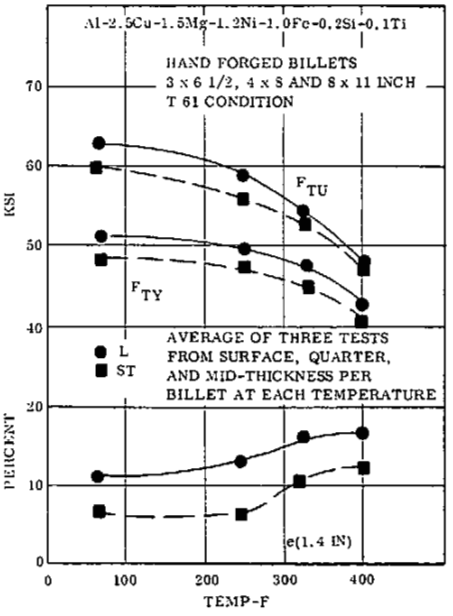


FIG. 3.03141 EFFECT OF TEST TEMPERATURE ON AVERAGE TENSILE PROPERTIES OF SEVERAL FORGINGS. (17)

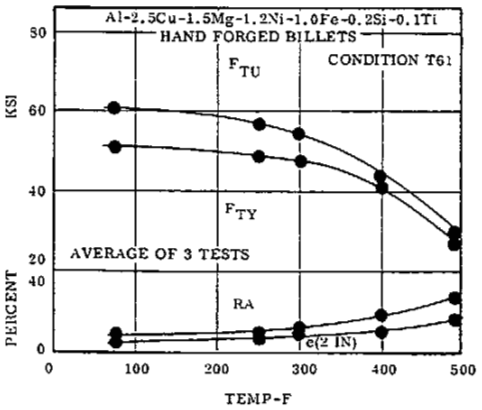


FIG. 3.03143 EFFECT OF ELEVATED TEMPERATURE ON TENSILE PROPERTIES OF HAND FORGED BILLETS. (11)(14)

| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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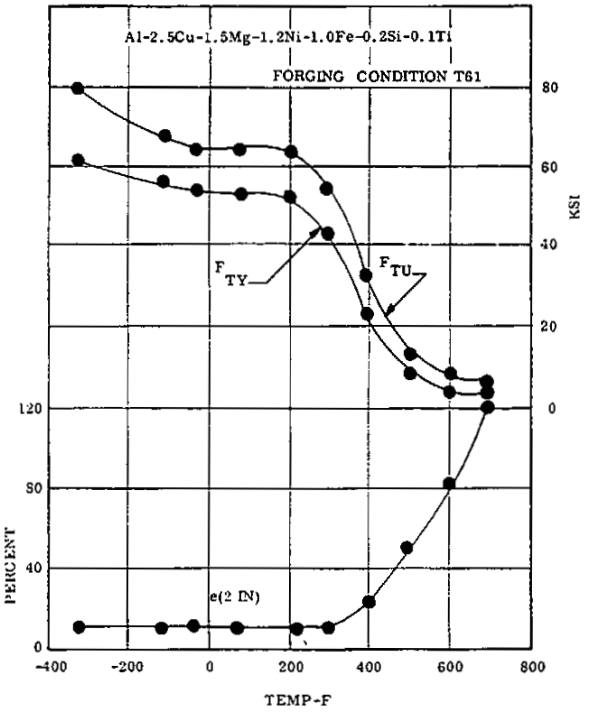


FIG. 3.03144 TYPICAL TENSILE PROPERTIES OF FORGING AT VARIOUS TEMPERATURES (4)

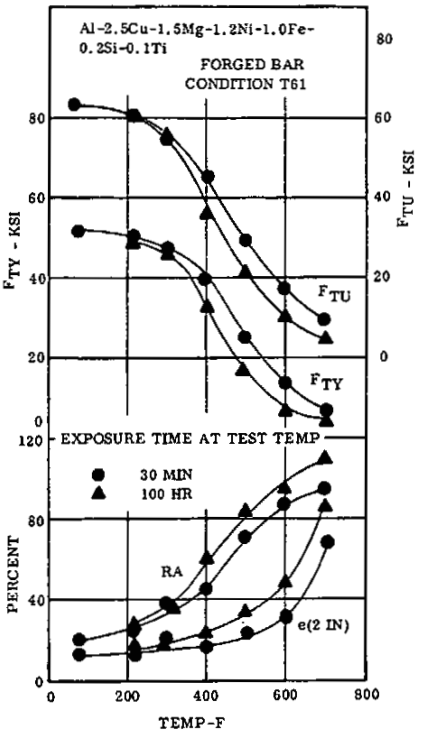


FIG. 3.03151 EFFECT OF ELEVATED TEMPERATURES AND EXPOSURE TIME ON TENSILE PROPERTIES OF BAR. (13)

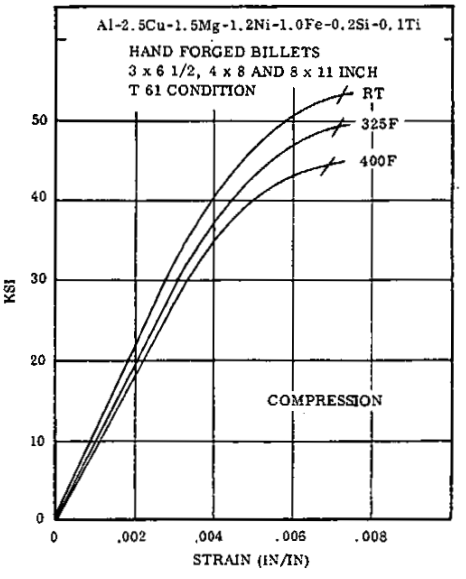


FIG. 3.03211 TYPICAL COMPRESSIVE STRESS - STRAIN CURVES AT ELEVATED TEMPERATURE FOR SEVERAL FORGINGS. (17)

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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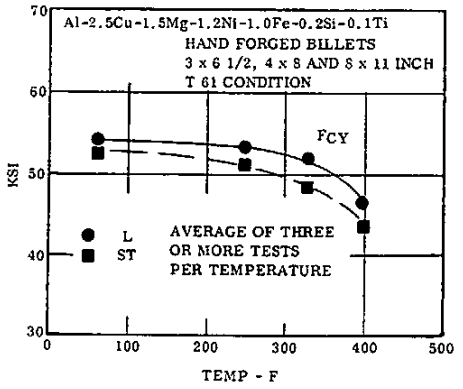



FIG. 3.0322 EFFECT OF ELEVATED TEMPERATURE ON AVERAGE COMPRESSIVE YIELD PROPERTIES OF SEVERAL FORGINGS. (17)

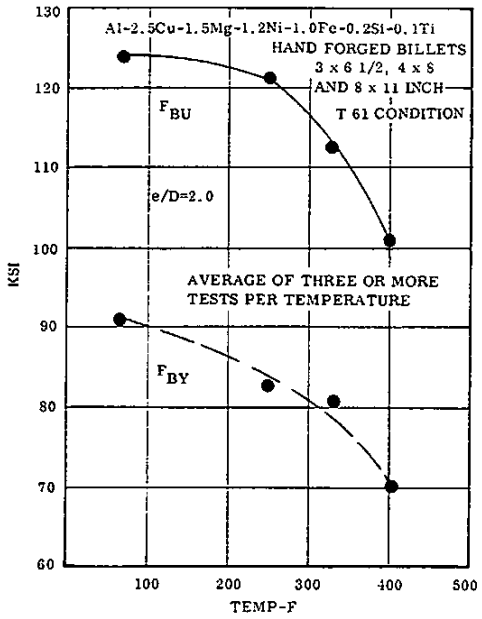



FIG. 3.0361 EFFECT OF ELEVATED TEMPERATURE ON AVERAGE BEARING PROPERTIES OF SEVERAL FORGINGS. (17)

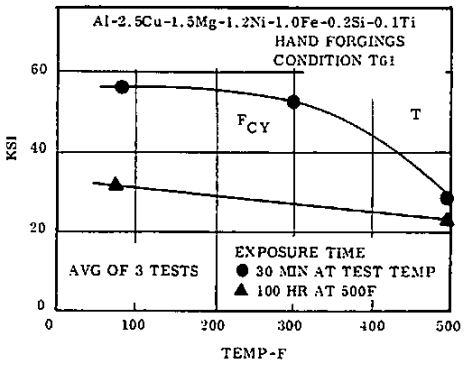



FIG. 3.0323 EFFECT OF ELEVATED TEMPERATURE AND EXPOSURE TIME ON COMPRESSIVE YIELD STRENGTH OF FORGINGS (11)(14)

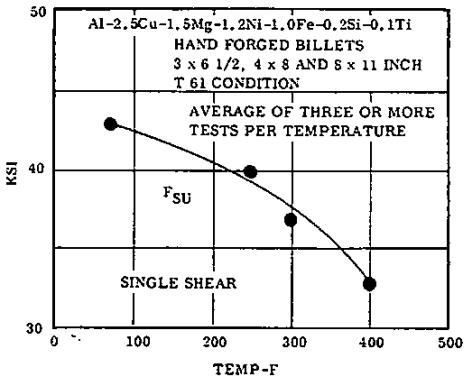



FIG. 3.0351 EFFECT OF ELEVATED TEMPERATURE ON AVERAGE SHEAR STRENGTH OF SEVERAL FORGINGS. (17)

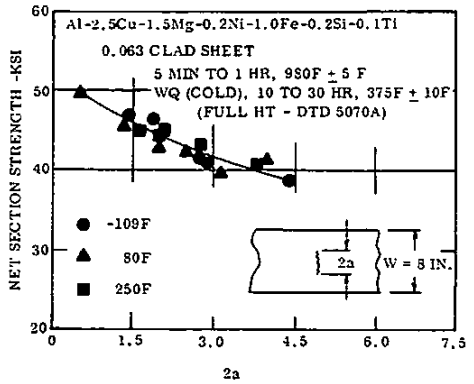



FIG. 3.03711 CRACK STRENGTH OF CLAD SHEET AT -109, 80 AND 250F FOR VARIOUS CRACK LENGTHS. (12)

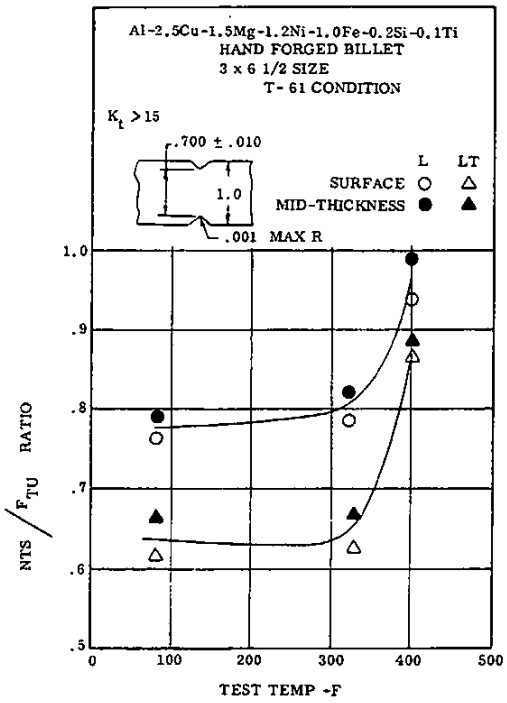
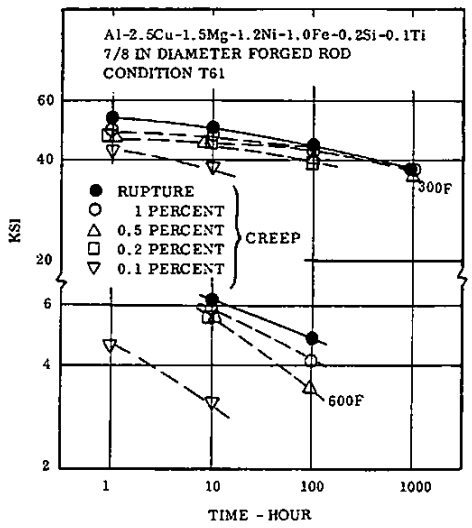



FIG. 3.03712 ELEVATED TEMPERATURE SHARP NOTCH STRENGTH RATIO OF FORGING FOR VARIOUS CROSS-SECTION LOCATIONS. (17)




| Al | |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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FIG. 3.042 CREEP AND CREEP RUPTURE CURVES FOR ROD AT ELEVATED TEMPERATURE (13)

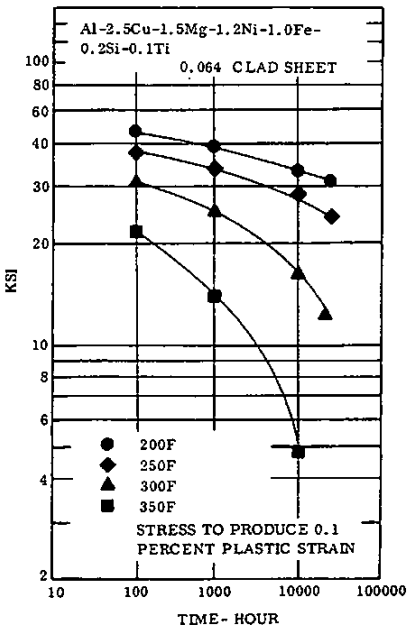


FIG. 3.041 CREEP CURVES FOR CLAD SHEET AT ELEVATED TEMPERATURE. (16)

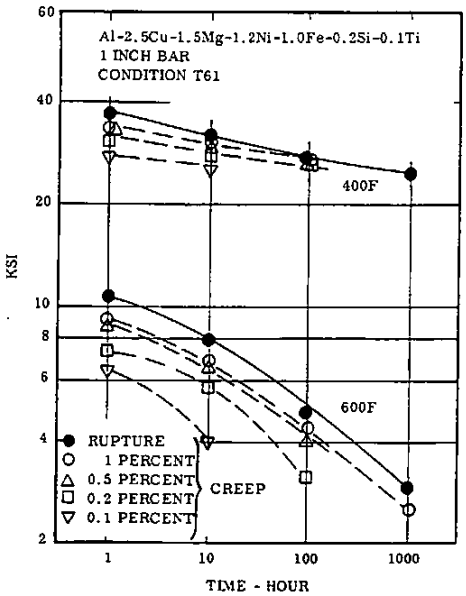


FIG. 3.043 CREEP AND CREEP RUPTURE PROPERTIES FOR BAR AT 400 AND 600F (13)

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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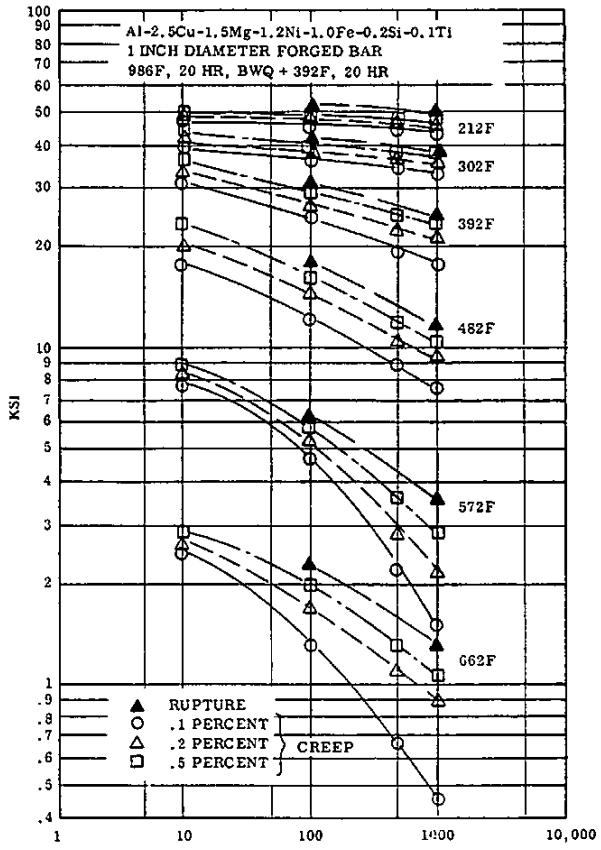


FIG. 3.044 CREEP AND CREEP RUPTURE PROPERTIES AT ELEVATED TEMPERATURES FOR FORGED BAR. (16)

| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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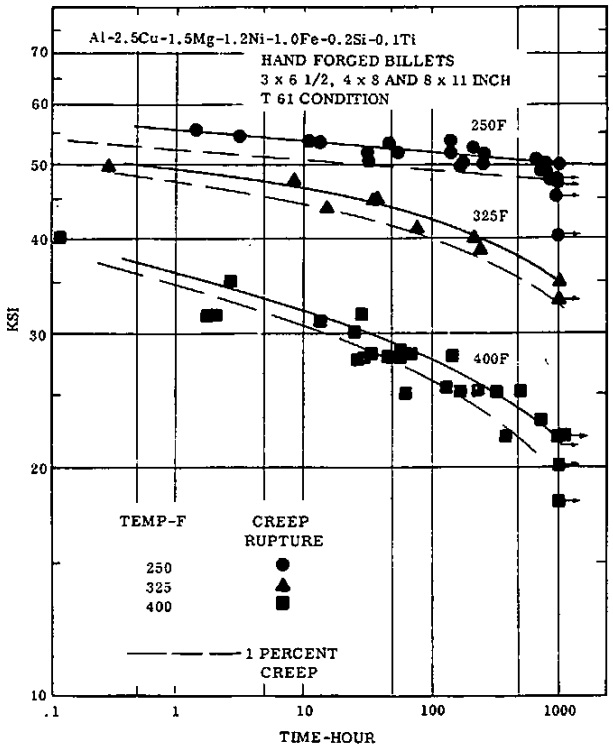



FIG. 3.045 CREEP AND CREEP RUPTURE CURVES FOR FORGING AT ELEVATED TEMPERATURES. (17)

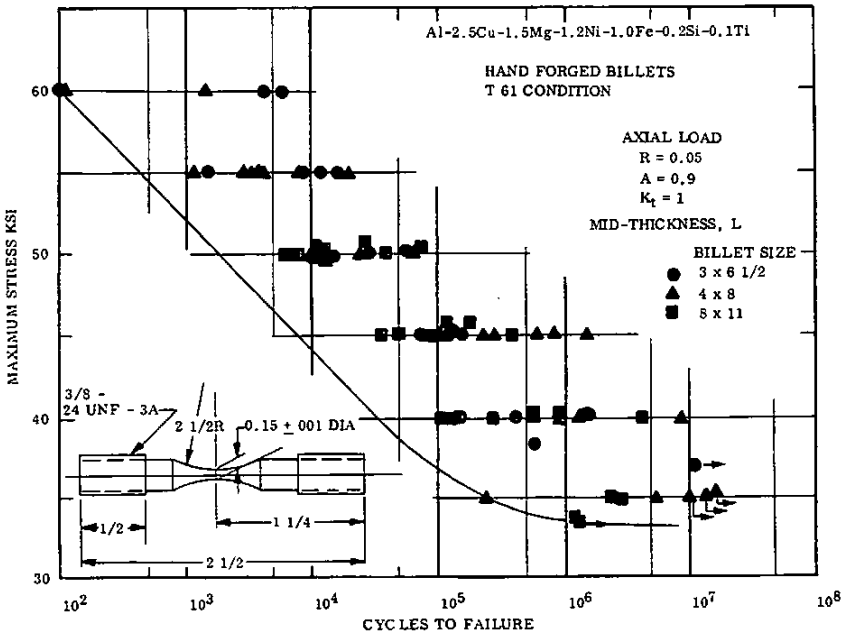



FIG. 3.0531 AXIAL LOAD FATIGUE STRENGTH FOR SMOOTH LONGITUDINAL SPECIMENS FROM SEVERAL FORGED BILLETS. (17)

| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

2618

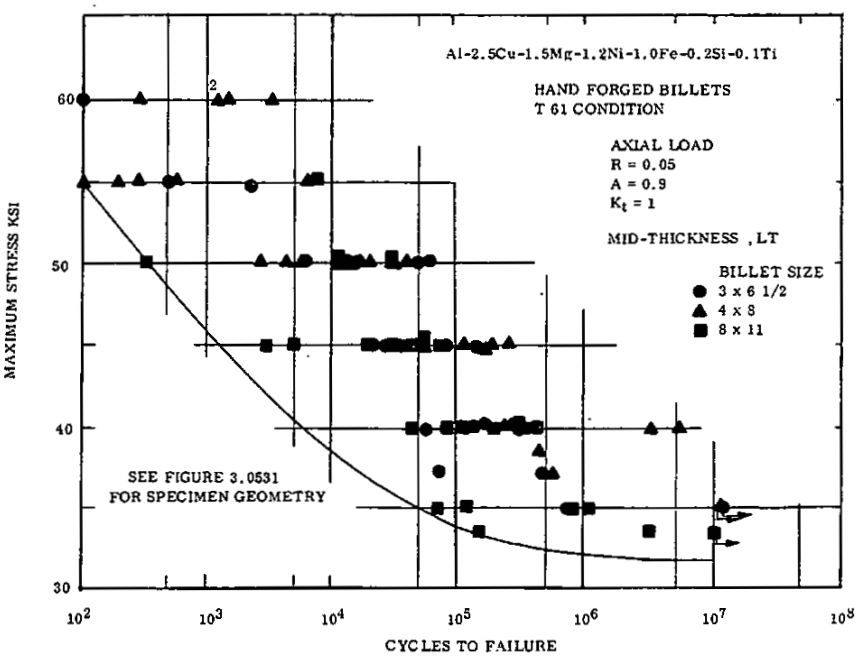



FIG. 3.0532 AXIAL LOAD FATIGUE STRENGTH FOR SMOOTH LONG-TRANSVERSE SPECIMENS FROM SEVERAL FORGED BILLETS. (17)

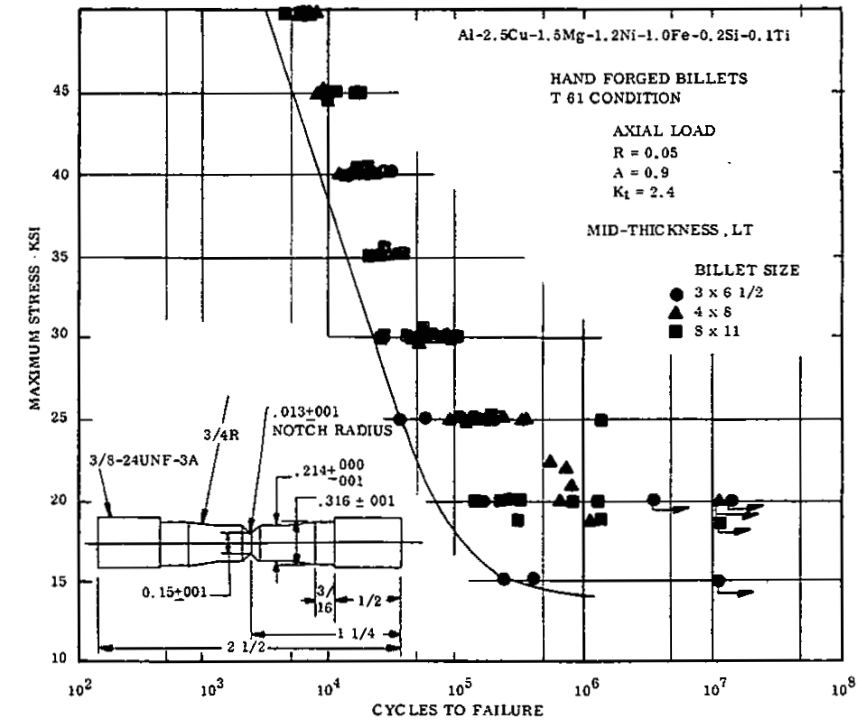



FIG. 3.0533 AXIAL LOAD FATIGUE STRENGTH FOR NOTCHED LONGITUDINAL SPECIMENS FROM SEVERAL FORGED BILLETS. (17)

| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

2618

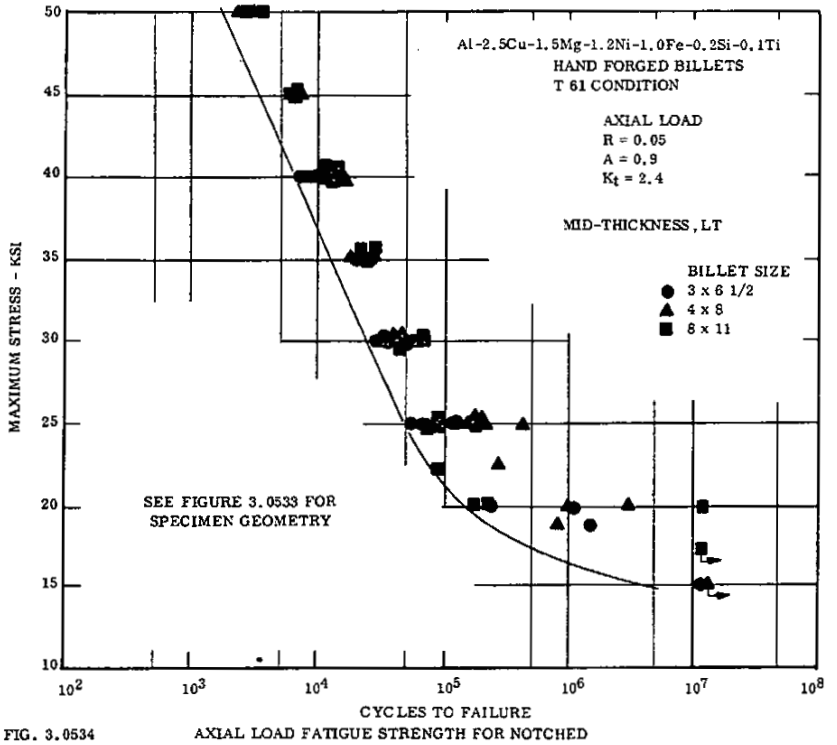
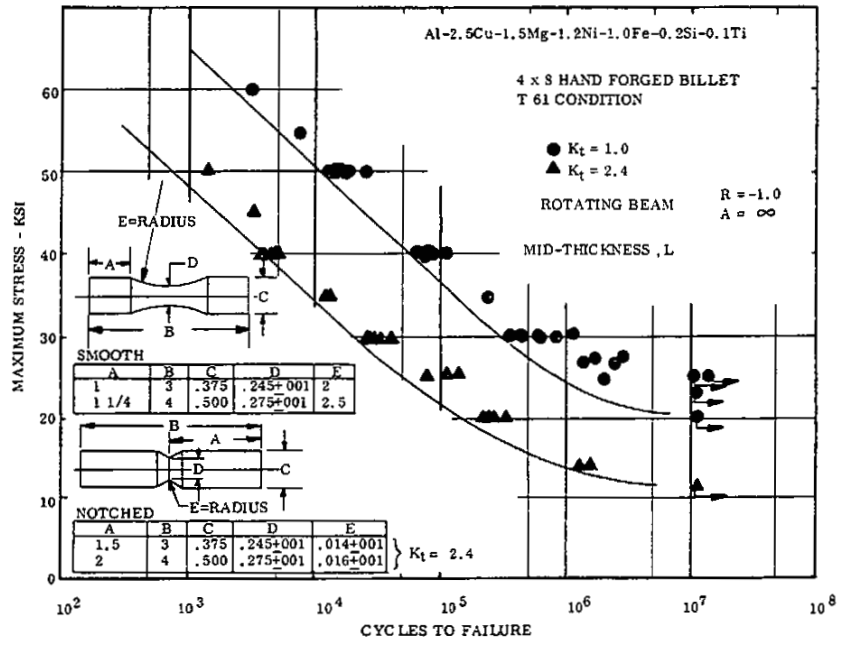



FIG. 3.0534 AXIAL LOAD FATIGUE STRENGTH FOR NOTCHED LONG-TRANSVERSE SPECIMENS FROM SEVERAL FORGED BILLETS. (17)




| SMOOTH A | B | C | D | E |
|---|---|---|---|---|
| 1 | 3 | .375 | .245±001 | 2 |
| 1 1/4 | 4 | .500 | .275±001 | 2.5 |

| NOTCHED A | B | C | D | E |
|---|---|---|---|---|
| 1.5 | 3 | .375 | .245±001 | .014±001 |
| 2 | 4 | .500 | .275±001 | .016±001 |

FIG. 3.0535 ROTATING BEAM FATIGUE STRENGTH FOR SMOOTH AND NOTCHED LONGITUDINAL SPECIMENS FROM FORGED BILLETS. (17)

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

2618

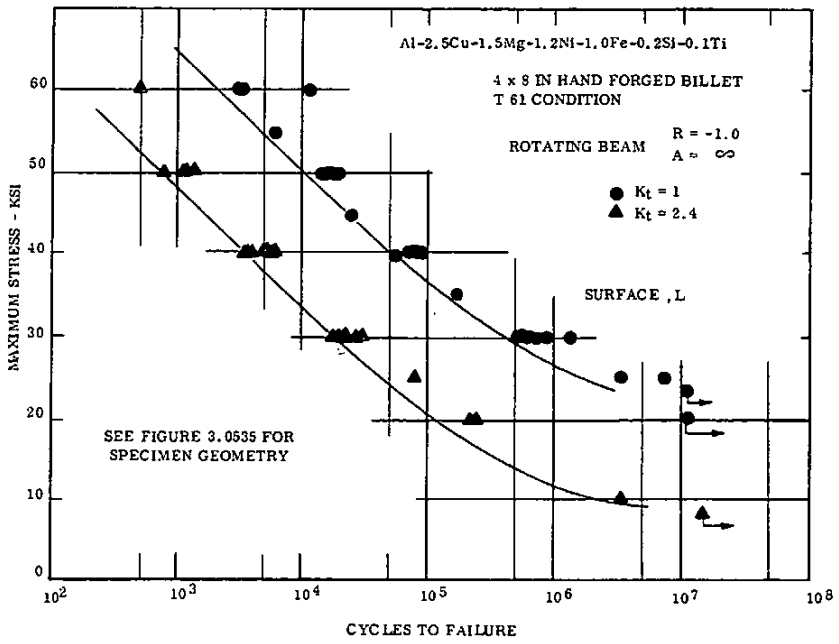



FIG. 3.0536 ROTATING BEAM FATIGUE STRENGTH FOR SMOOTH AND NOTCHED LONGITUDINAL SPECIMENS FROM FORGED BILLET. (17)

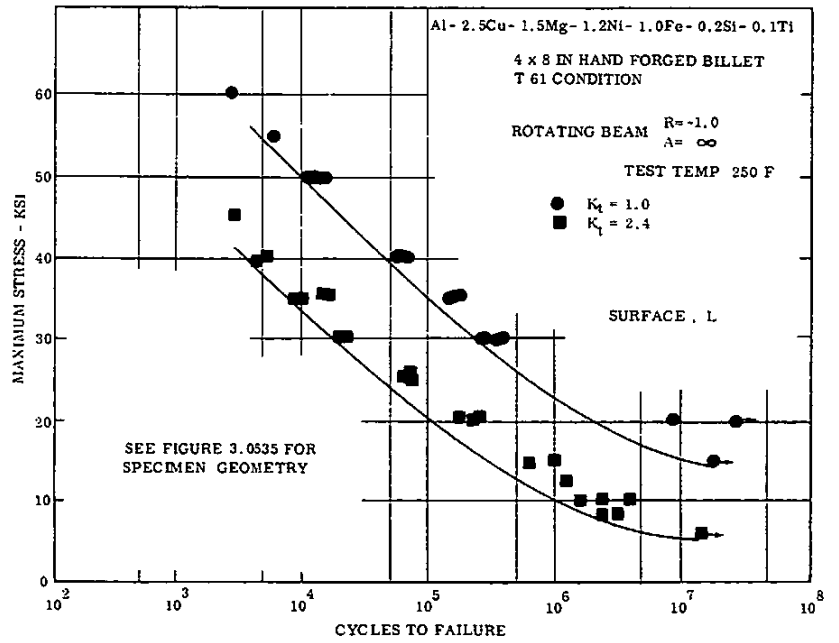



FIG. 3.0537 ROTATING BEAM FATIGUE STRENGTH FOR SMOOTH AND NOTCHED LONGITUDINAL SPECIMENS FROM FORGED BILLET TESTED AT 250F. (17)

| | Al |
|---|---|
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

2618

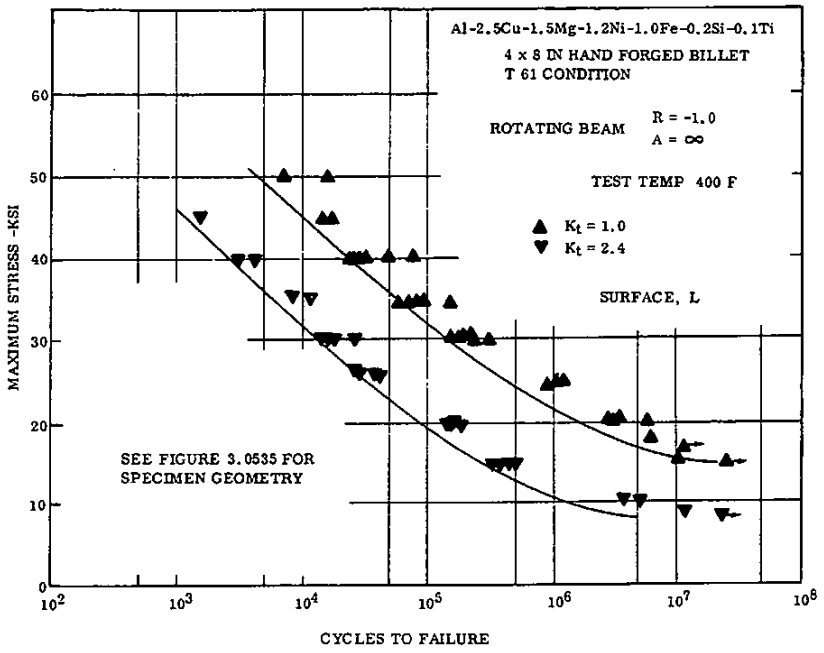



FIG. 3.0538 ROTATING BEAM FATIGUE STRENGTH FOR SMOOTH AND NOTCHED LONGITUDINAL SPECIMENS FROM FORGED BILLET TESTED AT 400F. (17)

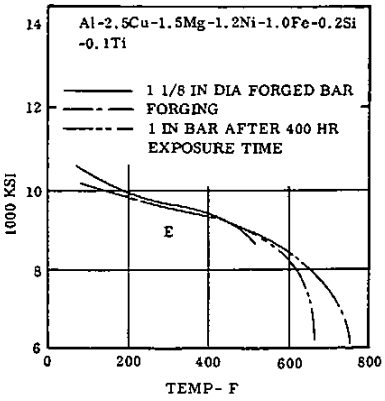



FIG. 3.0621 MODULUS OF ELASTICITY AT ROOM AND ELEVATED TEMPERATURE FOR FORGED BAR (7)

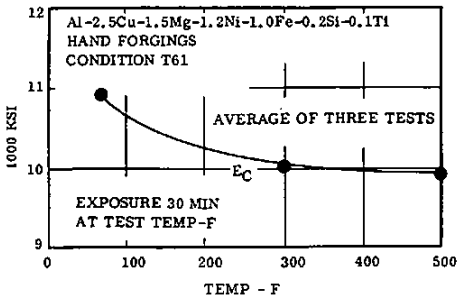



FIG. 3.0622 EFFECT OF TEST TEMPERATURE ON MODULUS OF ELASTICITY IN COMPRESSION. (14)

| | |
|---|---|
| | Al |
| 2.5 | Cu |
| 1.5 | Mg |
| 1.2 | Ni |
| 1.0 | Fe |
| 0.2 | Si |
| 0.1 | Ti |

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