NONFERROUS ALLOYS

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

1. GENERAL
This nonage-hardenable nickel-chromium alloy is widely used because of its excellent corrosion and oxidation resistance. The alloy is available in a variety of wrought forms and as sand and centrifugal castings. Its forming properties are similar to those of low alloy steels and it can be easily welded.

1.01 Commercial Designation
Inconel Alloy 600.

1.02 Alternate Designations
None.
Formerly: Inconel, Inconel Alloy, (Now obsolete).

1.03 Specifications
Table 1.03.

1.06 Hardness
Alloy can be hardened only by cold work.
1.061 Brinell hardness at room and elevated temperatures, Fig. 1.061.
1.062 Effect of hardness level on average room temperature tensile properties of rod, sheet, and strip, Fig. 1.062.

1.07 Forms and Conditions Available
1.071 Alloy is available in the full commercial range of sizes for sheet, strip, plate, bar, wire and tubing.
1.072 All products are available in the annealed condition.
1.073 Sheet and strip are available in deep drawing, skin hard, quarter hard, half hard, three quarters hard, full hard, and spring temper conditions. Plate is available in the "as rolled" condition.
1.074 Bar, wire, and tubing are available in cold-drawn condition.

TABLE 1.03

Form	AMS	ASME	ASTM	Federal	Military
Rods, bars, forgings	5565G	SB-166	B-166	-	MIL-N-6710 MIL-N-15721-A MIL-N-22987* MIL-N-23229*
Plate, sheet, strip	5540G	SB-168	B-168	-	MIL-N-6840 MIL-N-23228* MIL-N-22986* MIL-T-23227*
Pipe and tubing	5580D	SB-167	B-167	-	MIL-T-7840 MIL-T-22945
Condenser tubing		SB-163	B-163	-	
Wire	5687F			QQ-W-390	
Rivets	7232E				
Wire, welding ("62" Inconel)	5679B				MIL-R-5031-cl 8A
Wire, welding ("42" Inconel)	5683B				MIL-R-5031-cl 8

* For Nuclear Plant Service

1.04 Composition
Table 1.04.

TABLE 1.04

Source	AMS (1)(2)(3)*(5)(7)*		AMS (4)		AMS (6)	
	Percent		Percent		Percent	
	Min	Max	Min	Max	Min	Max
Carbon	-	0.15**	-	0.10	-	0.15
Chromium	14.00	17.00	14.0	17.0	13.0	17.0
Columbium	-	-	4xSi	-	1.5	4.0
Cobalt (if determined)	-	1.00	-	1.0	-	1.0
Copper	-	0.50	-	0.50	-	0.50
Iron	6.00	10.00	6.0	10.0	-	11.0
Manganese	-	1.00	-	1.0	-	1.5
Silicon	-	0.50	-	0.75	-	0.75
Sulfur	-	0.015	-	0.015	-	0.015
Nickel	72.00	-	70.0	-	68.0	-

* AMS (3) and (7) do not require as close limits as given above for Mn, Cr, Fe, Co and Ni
** AMS (7) gives 0.06.

1.05 Heat Treatment
1.051 Anneal
1.0511 For best formability. 1800F, 15 minutes, or up to 1900F for a few seconds. Longer time at 1900F results in excessive grain growth.
1.0512 Forgings. AMS (3), 1900 to 1950F, air cool.
1.0513 For high temperature creep and rupture strength, 2000-2100F, 1 to 2 hours.
1.052 Stress relief
1.0521 Complete stress relief, approximately 1600F, 1 hour.
1.0522 Springs for optimum relaxation resistance and fatigue strength. 900F, 1 hour.

1.08 Melting and Casting Practice
Induction furnace air melt ingots up to 15,000 pounds.

1.09 Special Considerations
Contact with sulfur-containing atmospheres at elevated temperatures should be avoided.

2. PHYSICAL AND CHEMICAL PROPERTIES

2.01 Thermal Properties
2.011 Melting range. 2500 to 2600F, (8).
2.012 Phase changes. None.
2.0121 Time-temperature-transformation diagrams
2.013 Thermal conductivity, Fig. 2.013.
2.014 Thermal expansion, Fig. 2.014.
2.015 Specific heat, Fig. 2.015.
2.016 Diffusivity, Fig. 2.016.

2.02 Other Physical Properties
2.021 Density. 0.304 lb per cu in. 8.43 gr per cu cm, (8).
2.022 Electrical resistivity, Fig. 2.022.
2.023 Magnetic properties
2.0231 Alloy is nonmagnetic at room temperature. Magnetic permeability at 200 oersteds 1.006 to 1.008, (8).
2.0232 Effect of permeability and prior processing on Curie temperature, Fig. 2.0232.
2.0233 Effect of low temperature on permeability at 100 oersteds, Fig. 2.0233.
2.024 Emissivity, Fig. 2.024.
2.025 Damping capacity

2.03 Chemical Properties
2.031 Corrosion resistance.
2.0311 Alloy is resistant to a variety of corrosive agents. It is highly resistant to corrosion by fresh water and by moving sea water. Pitting may occur in quiet or stagnant sea water.

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

2.0312 Due to its chromium content alloy is superior to pure nickel in resistance to attack by oxidizing agents. Alloy exhibits considerable resistance to corrosion under reducing conditions.

2.0313 Alloy is not subject to chloride-ion stress-corrosion cracking. Alloy is subject to stress-corrosion cracking in high-temperature, high strength caustic alkalies or in the presence of mercury at elevated temperatures.

2.0314 Alloy will remain bright indefinitely in indoor atmospheres and will not "fog" in damp sulfurous atmospheres.

2.0315 Alloy is unaffected by the majority of neutral and alkaline salt solutions.

2.0316 Alloy is corroded by hypochlorites but is unaffected by the alkaline solutions which contain hydrogen peroxide. Alloy is highly resistant to corrosion by magnesium chloride solutions.

2.0317 Alloy possesses fair resistance to corrosion by sulfuric and hydrochloric acids. It exhibits practically complete resistance to organic acids as they occur in food products and alcoholic beverages.

2.0318 Alloy is almost entirely resistant to attack by solutions of ammonia and is unaffected by dry chlorine or dry hydrogen chloride at room temperature.

2.0319 Alloy is completely resistant to all mixtures of steam, air and carbon dioxide.

2.032 Oxidation resistance

2.0321 Alloy is resistant to oxidation in bright-annealing and nitriding atmospheres.

2.0322 Alloy does not embrittle after long exposure at high temperatures.

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	AMS (1)			AMS (2)	AMS (8)						AMS (7)		
Alloy	Inconel Alloy 600												
Form	Sheet, strip, plate			Tubing, Seamless	Rounds			Squares, Hexagons, Rectangles		Forgings	Wire, coiled		
Condition	Sheet, strip CR + Ann Plate - HR + Ann			CD + Ann	≤ 2.5CD > 2.5 HR			HR			CD + Ann		
Thickness	0.010 to 0.017	0.017 to 0.037	> 0.037		≤1.0	>1 to 2.5	>2.5 (a)	≤0.5	>0.5	(b)	0.002 to 0.015	>0.015 to 0.040	>0.040
F_{tu}, min-ksi	80	80	80	80	-	-	85	-	-	80	-	-	-
max-ksi	100	100	100	105	-	-	-	-	-	-	130	115	110(c)
F_{ty}, min-ksi	30	30	30	30	-	-	35	-	-	30	-	-	-
e(2in), min-percent	30	38	40	35	-	-	30	-	-	35	-	-	-
Hardness, BHN - min	-	-	-	-	229	207	134	134	134	-	-	-	-
- max	-	-	-	-	311	285	217	241	217	187	-	-	-

(a) Specimens from rounds < 4.5 and > 2.5

(b) Specimens from forgings > 2.5

(c) Straight lengths 125 ksi

3.012 ASME Boiler and Pressure Vessel Code design mechanical properties at elevated temperatures, Table 3.012.

TABLE 3.012

Source		ASME (15)												
Alloy		Inconel Alloy 600												
Form		SB-166 Bar, rod shapes & forg.		SB-166 Bolting				SB-167 pipe or tube seamless				3B-163 Cond-enser tube, seam-less, Ann(c)	SB-168 Plate, sheet, strip	
Condition		Ann	HW	Ann (a)	HW (b)	HW (c)	CD (a)	HW NW or Ann: (e)	HW NW or Ann: (d)	CD + Ann (e)	CD + Ann (d)		HR or CR + Ann	As HR plate
Property	Test temp													
F_{tu}, min-ksi	RT	80	85	80	85	90	90	80	75	80	80	80	80	85
F_{ty}, min-ksi	RT	35	35	35	35	40	40	30	25	35	30	35	35	35
F_{tu}, min-ksi (allowable design stress)	100	20	21.2	8.7	8.7	10	10	20	16.65	20	20	20	20	21.2
	200	19.3	20.2	8.1	8.5	9.5	9.5	19.1	15.3	19.3	19.1	19.3	19.3	20.2
	300	18.8	20	7.8	8.2	9.2	9.2	18.2	14.5	18.8	18.2	18.8	18.8	20
	400	18.5	20	7.7	8.0	9.1	9.1	17.45	14	18.5	17.45	18.5	18.5	20
	500	18.5	20	7.6	7.9	9.1	9.1	16.85	13.6	18.5	16.85	18.5	18.5	20
	600	18.5	20	7.5	7.9	9.1	-	16.1	13.2	18.5	16.1	18.5	18.5	20
	700	18.5	20	7.3	7.9	8.9	-	15.6	13	18.5	15.6	18.5	18.5	20
	800	18.5	20	7.1	7.7	8.8	-	15.3	12.75	18.5	15.3	18.5	18.5	20
	900	16	19.5	6.9	7.4	8.6	-	14.9	11.8	16	14.9	16	16	19.5
	1000	7	14.5	6.8	7.3	8.3	-	7	7	7	7	7	7	14.5
	1100	3	7.2	3	7.2	7.3	-	3	3	3	3	3	3	7.2
	1200	2	5.5	2	5.5	5.5	-	2	2	2	2	2	2	5.5

(a) All sizes

(b) Rounds over 3 in and shapes, all sizes

(c) Rounds to 3 inch, inclusive

(d) Over 5 inch OD

(e) 5 inch OD and under

Ni
15 Cr
7 Fe

INCONEL ALLOY 600

3.02 <u>Mechanical Properties at Room Temperature</u>
See 3.03, also.

3.021 Tension

3.0211 Stress-strain diagrams

3.0212 Typical tensile properties, Table 3.0212.

TABLE 3.0212

Source	(8)												
Alloy	Inconel Alloy 600												
Form	Sheet, Strip	Sheet	Strip	Plate		Bar			Wire			Tube and Pipe	
Condition	Ann	Hard Temper	Spring Temper	HR	Ann	CD	HR	Ann	CD + Ann	No. 1 Temper	Spring Temper	HR + HR +Ann	CD + Ann
F_{tu}, ksi	80-100	120-150	145-170	85-110	80-105	105-150	85-120	80-100	80-120	105-125	170-220	75-100	80-100
F_{ty}, ksi	30-45	90-125	120-160	35-65	30-50	80-125	35-90	(a)25-50	35-75	70-105	150-210	25-50	25-50
e(2 in), %	55-35	15-2	10-2	50-30	55-35	30-10	50-30	55-35	45-20	35-15	5-2	55-35	55-35
RA, %	-	-	-	-	-	60-30	65-50	70-60	-	-	-	-	-

(a) Ann after hot rolling gives 30-50 ksi.

3.0213 Room temperature properties of forgings made by different forging practices, Table 3.0213.

TABLE 3.0213

Source	(8)			
Alloy	Inconel Alloy 600			
Form	Forgings made by various practices			
Condition	Small grain Hard	Small grain Soft	Large grain Hard	Large grain Soft
F_{tu}, ksi	103	92	102	86.4
F_{ty}, ksi	64.6	40.5	74.7	32.7
e, %	35	44	28	61.7
RA, %	60.3	61	56.7	50.7
Hardness, RB	93	83.5	94	76.5
Grain size - in	0.0028(a)	0.0028	0.006-0.2(b)	0.006-0.02 (b)

(a) Average diameter
(b) Mixed grain size between limits shown

3.022 Compression

3.0221 Stress-strain diagrams

3.0222 Compressive yield properties of bar and tube as function of tensile strength, Fig. 3.0222.

3.023 Impact

3.024 Bending

3.025 Torsion and shear

3.0251 Relation between shear strength and tensile strength of sheet, strip and wire, Fig. 3.0251.

3.026 Bearing

3.0261 Relation between bearing properties and tensile strength of sheet, Fig. 3.0261.

3.027 Stress concentration

3.0271 Notch properties

3.0272 Fracture toughness

3.028 Combined properties

3.03 <u>Mechanical Properties at Various Temperatures</u>

3.031 Tension

3.0311 Stress-strain diagrams

3.0312 Effect of low test temperature on tensile properties of cold drawn and annealed material, Fig. 3.0312.

3.0313 Effect of test temperature on tensile properties of hot rolled material, Fig. 3.0313.

3.032 Compression

3.0321 Stress-strain diagrams

3.033 Impact

3.0331 Effect of test temperature on impact strength of annealed, hot rolled, and cold drawn material, Fig. 3.0331.

3.034 Bending

3.035 Torsion and shear

3.0351 Effect of exposure and test temperature on shear strength of wire, Fig. 3.0351.

3.036 Bearing

3.037 Stress concentration

3.0371 Notch properties

3.0372 Fracture toughness

3.038 Combined properties

3.04 <u>Creep and Creep Rupture Properties</u>

3.041 Creep and creep rupture curves for sheet and plate at 1350 to 1800F, Fig. 3.041.

3.042 Creep rupture curves for bar at 1000 to 2100F, Fig. 3.042.

3.043 Creep and stress-rupture curves at 1300 to 1650F of sheet annealed at 1900F and tested in argon, Fig. 3.043.

3.044 Creep and stress-rupture curves at 1300 to 1650F of sheet annealed at 2050F and tested in argon, Fig. 3.044.

3.045 Creep and stress-rupture curves at 1300 to 1650F of sheet annealed at 2050F and tested in fused salt No. 30, Fig. 3.045.

3.046 Creep stress for secondary creep rate of 0.01% per 1000 hours at temperatures from 800F to 2100F, Fig. 3.046.

3.047 Creep stress for secondary creep rate of 0.1% per 1000 hours at temperatures from 800F to 2100F, Fig. 3.047.

3.048 Effect of sheet thickness on creep and creep rupture properties in fused salt No. 30 at 1500F under 3.5 ksi, Fig. 3.048.

3.049 Creep rupture curves for smooth and notched plate at 1350 to 1800F, Fig. 3.049.

3.0410 Isochronous stress-strain curves for sheet at 1200 to 1650F, Fig. 3.0410.

3.0411 Isochronous stress-strain curves for sheet annealed at 1900F and tested in argon at temperatures from 1300 to 1650F, Fig. 3.0411.

3.0412 Isochronous stress-strain curves for sheet annealed at 2050F and tested in argon at temperatures from 1300 to 1650F, Fig. 3.0412.

3.05 <u>Fatigue Properties</u>

3.051 Fatigue strength of bar at room temperature, Table 3.051.

TABLE 3.051

Source	(8)				
Form	1/2 to 1 in bar				
Condition	F_{tu}, (ksi)	Method	Stress Ratio A	Stress Ratio R	Fatigue Strength - ksi at 10^8 cycles
Ann	88 to 97	Rot beam	∞	-1	30 to 35.5
HW	93 to 99	Smooth			38.5 to 47
CD	126 to 153	K_t = 1			41 to 56
CD + 525F, 3 hr	130 to 163				45 to 60

3.052 Rotating-beam fatigue tests of forged specimens, Fig. 3.052.

3.053 Strain-cycling fatigue behavior at room temperature of forgings made by different practices, Fig. 3.053.

3.054 Effect of test temperature on fatigue strength of bar, Fig. 3.054.

3.055 Strain-cycling fatigue behavior at room and elevated temperatures, Fig. 3.055.

3.06 <u>Elastic Properties</u>

3.061 Modulus of elasticity at room temperature in tension and compression, 31 x 10^3 ksi.

3.062 Modulus of elasticity at room and elevated temperatures, Fig. 3.062.

3.063 Modulus of rigidity, 11 x 10^3 ksi at 70F.

3.064 Poisson's ratio 0.29 at 70F.

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

4. FABRICATION

4.01 Formability

4.011 Hot forming. Maximum heating temperature for forging or hot-rolling is 2250F. Somewhat lower temperatures for final reheating will produce a finer-grained product. Heavy forging or hot-rolling should be done between 2250F and 1900F. Light work can be continued down to 1600F.

4.012 Cold forming. Alloy can be cold-formed by standard processes used for steel or stainless steel.

4.02 Machining and Grinding

Alloy is best machined with heavy-duty equipment using cutting tools large and heavy enough to withstand the load and quickly dissipate heat. Either high-speed-steel or cemented carbide tools may be used. For rough turning, interrupted cuts, cutting with minimum surface work-hardening, finishing to close tolerances, or finishing to the lowest RMS surface, grades M-35 or T-15 tool steel should be used. Cemented carbide tools are best for high speed continuous cutting to ordinary tolerances and smoothness. Grade C-2 is recommended for light roughing and finishing while Grade C-6 is best for heavier work.

4.03 Welding

Alloy can be joined by the usual welding, brazing and soldering processes common to industry, Table 4.03.

TABLE 4.03

Source	(8)	
Alloy	Inconel Alloy 600	
Process	Recommended Joining Products	Notes
Metal Arc	Inconel Welding Electrode 182 or Inconel Welding Electrode 132	Cleanliness important
Atomic Hydrogen	Inconel Filler Metal 82 or Inconel Filler Metal 62	Special application
Inert Gas Processes	Inconel Filler Metal 82 or Inconel Filler Metal 62	Short arc important with tungsten-arc
Oxy-acetylene	Inconel Filler Metal 42 Incoflux 2 Gas Welding Flux	Use slightly reducing flame
Silver Brazing	Any silver containing alloy not containing phosphorus, plus suitable flux	Use only where corrosion will permit. Avoid overheating and high stresses during brazing.
Braze Welding	Usual alloys and fluxes	Not recommended --- prefer welding
Soft Soldering	Any solder and acid type flux	Use only when corrosion will permit. Do not depend on solder joint for strength.
Resistance Welding		
Spot	None required	Important considerations:
Seam	None required	a. Cleanliness
Projection	None required	b. Heavy pressure
Flash	None required	c. Consistent controls

4.04 Heat Treatment

4.041 Heating and annealing should be performed in a slightly reducing sulfur-free atmosphere with at least 2 percent carbon monoxide plus hydrogen.

4.042 Bright annealing can be performed by using a dry hydrogen atmosphere.

4.05 Surface Treatment

4.051 Because of the refractory nature of the oxide film which is formed on the alloy and the danger of intergranular attack from acid solutions, the use of fused salt-bath descaling is recommended.

4.052 Black finishing is obtained by using methods which are standard for nickel.

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

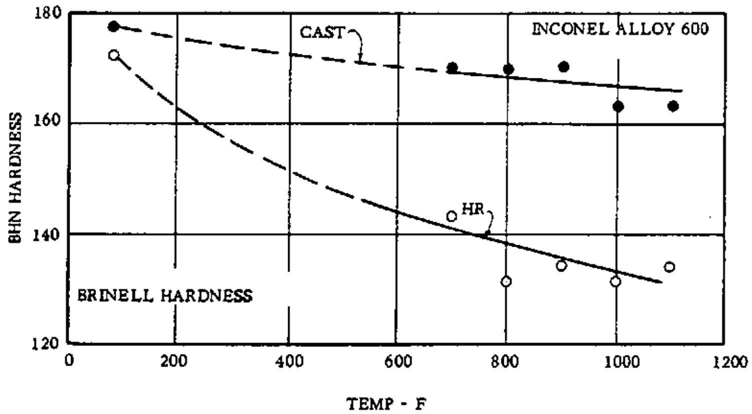

FIG. 1.061 BRINELL HARDNESS AT ROOM AND ELEVATED TEMPERATURES (8, p.13)

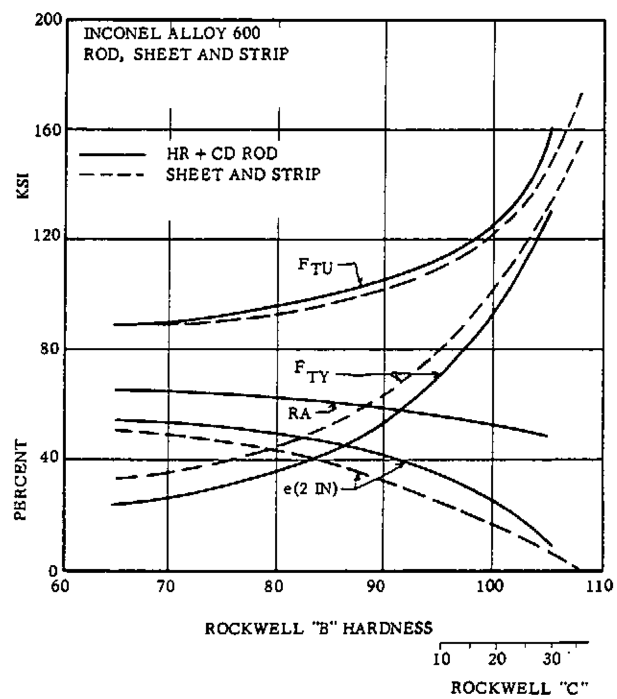

FIG. 1.062 EFFECT OF HARDNESS LEVEL ON AVERAGE ROOM TEMPERATURE TENSILE PROPERTIES OF ROD, SHEET AND STRIP (8, p.6)

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

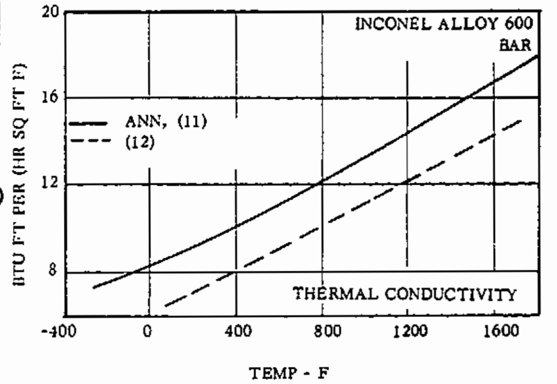

FIG. 2.013 THERMAL CONDUCTIVITY

(11, Tbl. VII)(12, Tbl. 58-44)

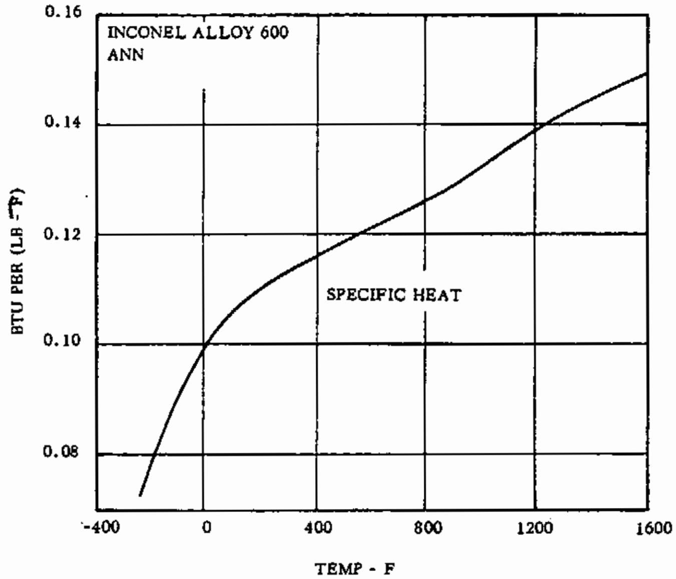

FIG. 2.015 SPECIFIC HEAT (8, p.5)

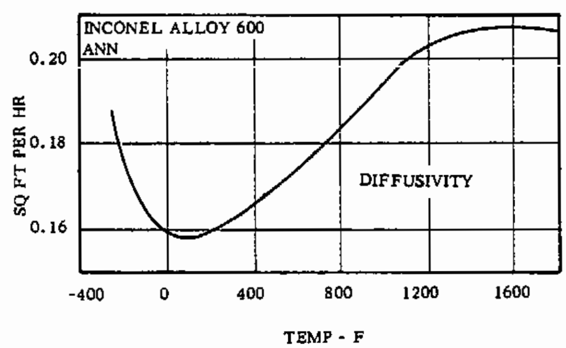

FIG. 2.016 DIFFUSIVITY (11, FIG. 16)

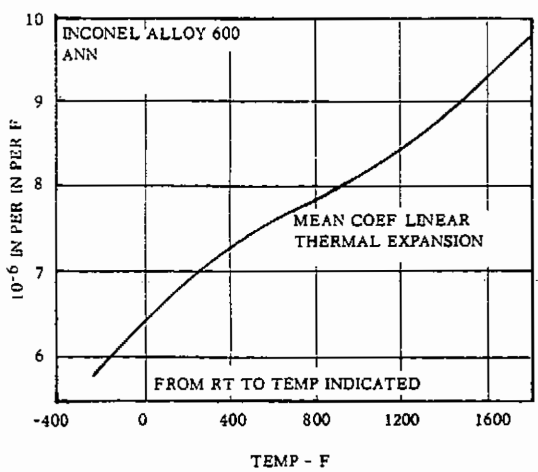

FIG. 2.014 THERMAL EXPANSION (11, Fig. 16)

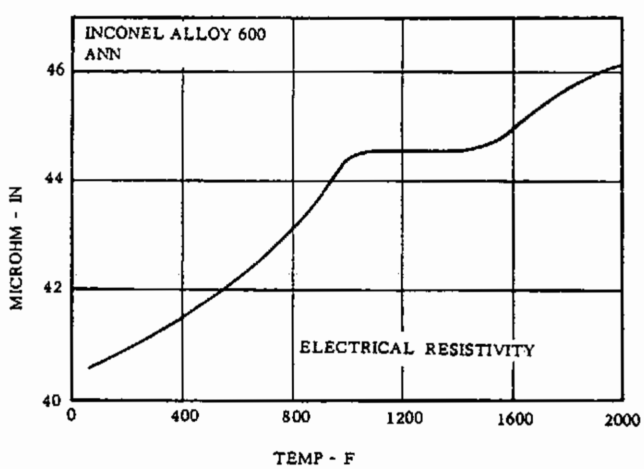

FIG. 2.022 ELECTRICAL RESISTIVITY (8, p.5)

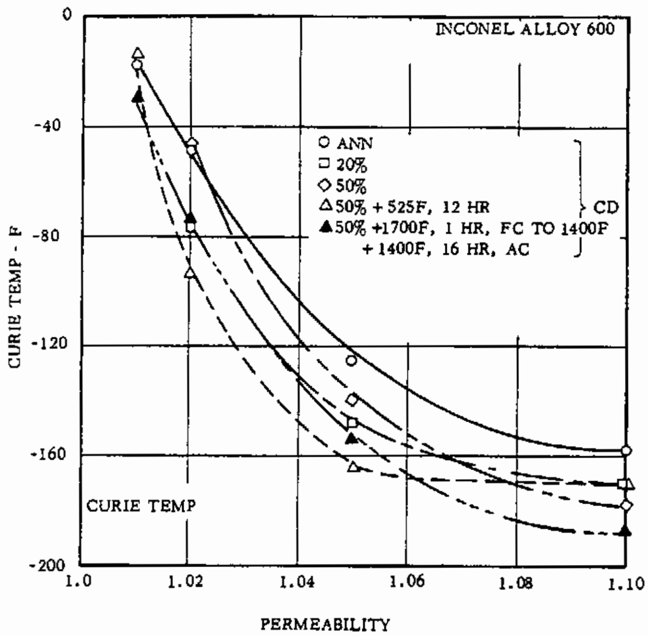

FIG. 2.0232 EFFECT OF PERMEABILITY AND PRIOR PROCESSING ON CURIE TEMPERATURE (8, p.4)

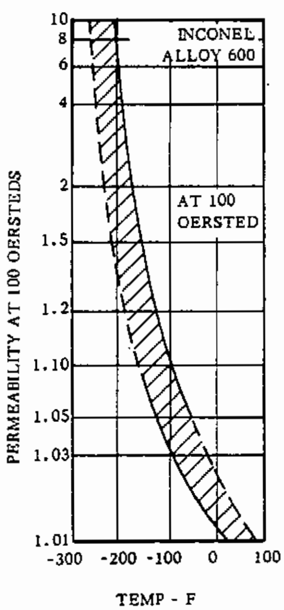

FIG. 2.0233 EFFECT OF LOW TEMPERATURES ON PERMEABILITY AT 100 OERSTEDS (9, p.6)

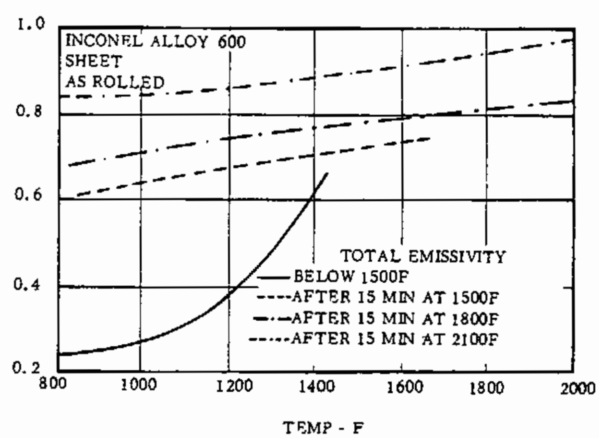

FIG. 2.024 EMISSIVITY (14, Fig. 7)

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

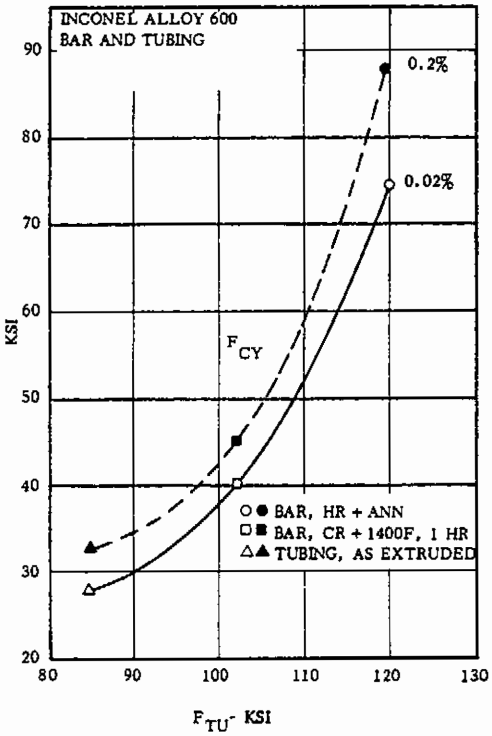

FIG. 3.0222 COMPRESSIVE YIELD PROPERTIES OF BAR AND TUBE AS FUNCTION OF TENSILE STRENGTH (8, p. 6)

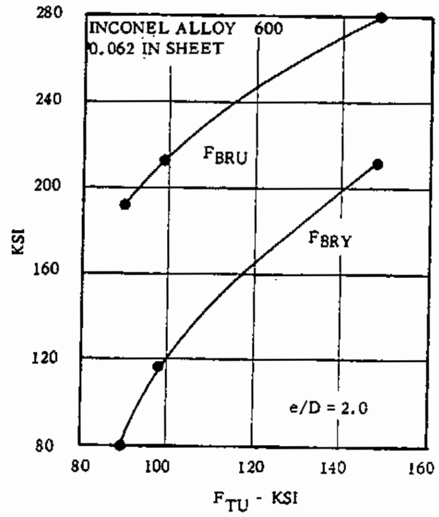

FIG. 3.0261 RELATION BETWEEN BEARING PROPERTIES AND TENSILE STRENGTH OF SHEET (8)

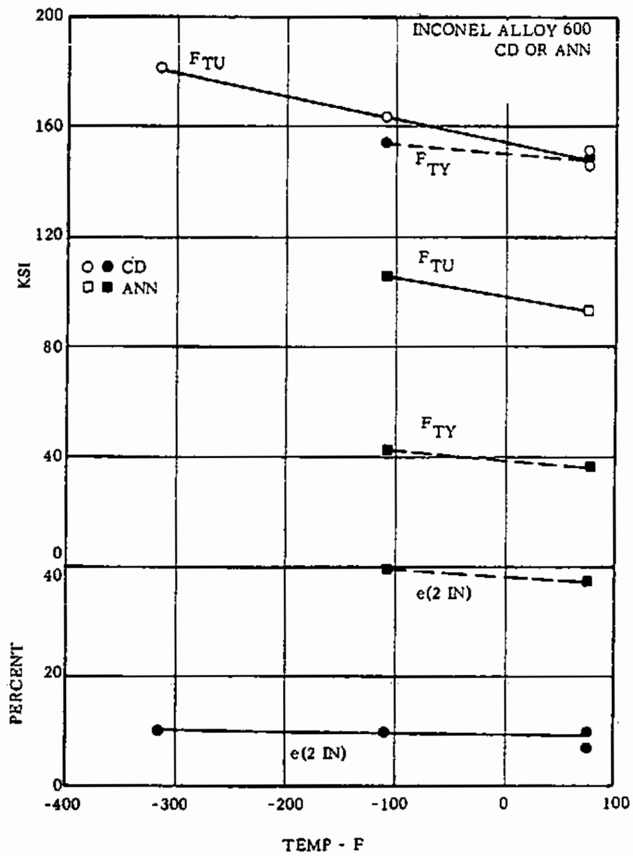

FIG. 3.0312 EFFECT OF LOW TEST TEMPERATURE ON TENSILE PROPERTIES OF COLD DRAWN AND ANNEALED MATERIAL (8, p. 13)

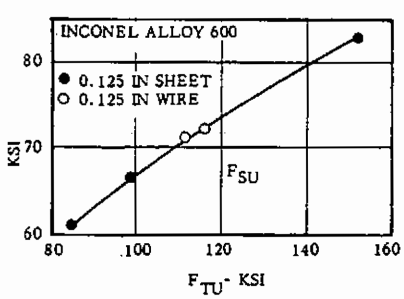

FIG. 3.0251 RELATION BETWEEN SHEAR STRENGTH AND TENSILE STRENGTH OF SHEET AND WIRE (8, p. 7, TBL. IX)

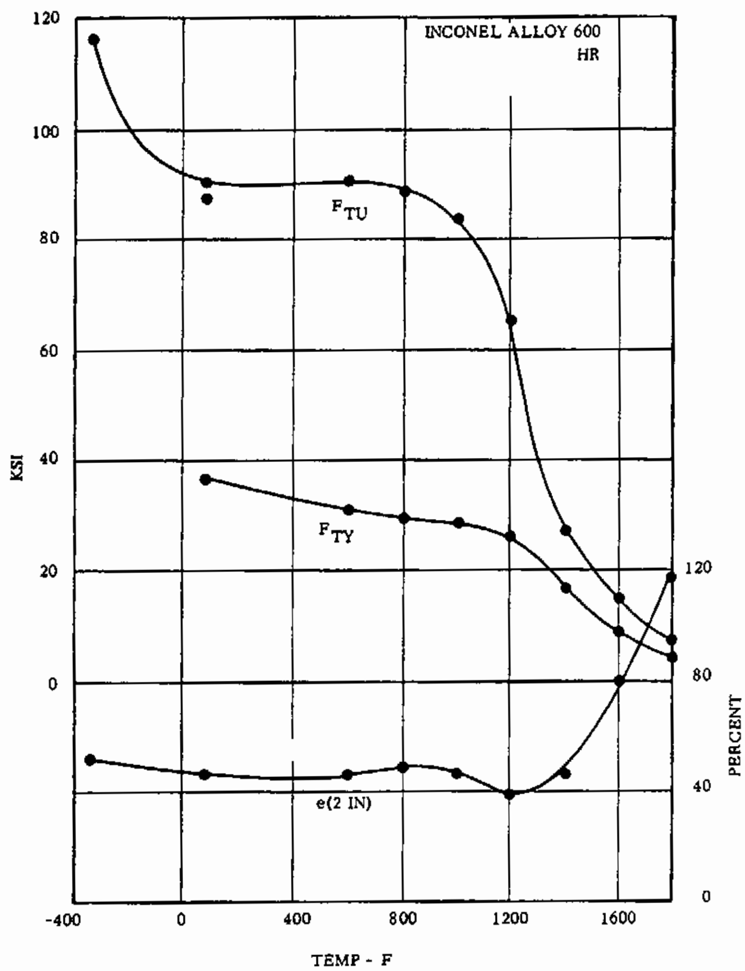

FIG. 3.0313 EFFECT OF TEST TEMPERATURE ON TENSILE PROPERTIES OF HOT ROLLED MATERIAL (8, p. 10)

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

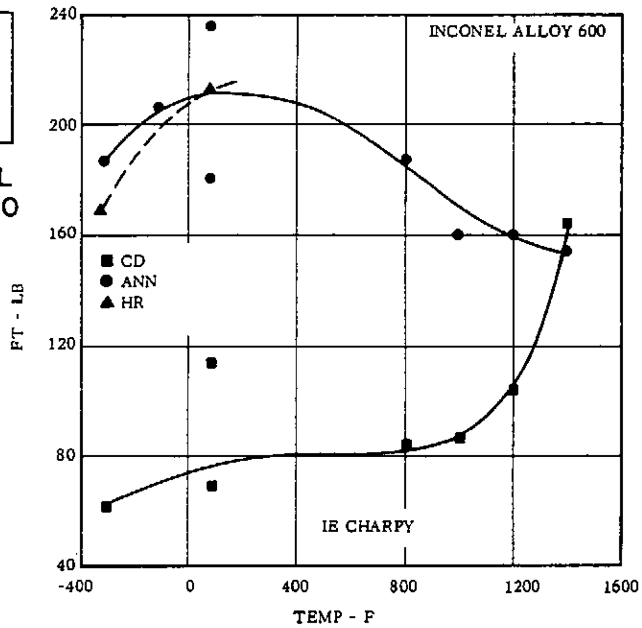

FIG. 3.0331 EFFECT OF TEST TEMPERATURE ON IMPACT STRENGTH OF ANNEALED, HOT ROLLED AND COLD DRAWN MATERIAL (8, p. 13)

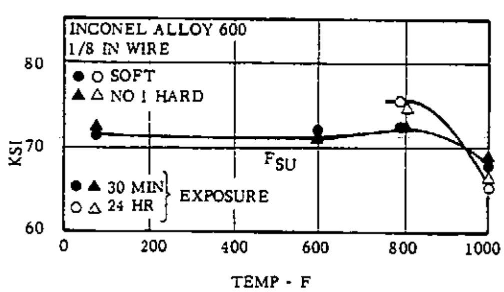

FIG. 3.0351 EFFECT OF EXPOSURE AND TEST TEMPERATURE ON SHEAR STRENGTH OF WIRE (8, p. 7)

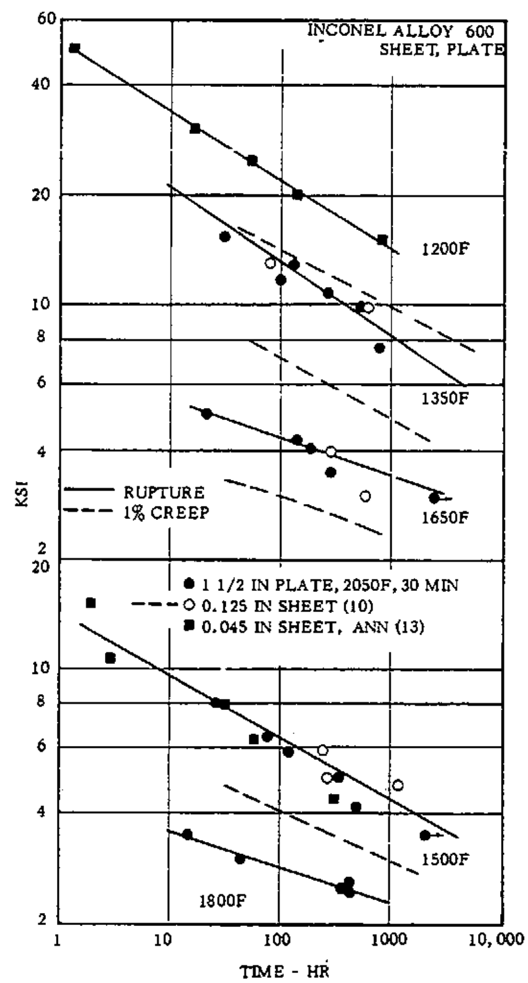

FIG. 3.041 CREEP AND CREEP RUPTURE CURVES FOR SHEET AND PLATE AT 1350F TO 1800F (13)(10)

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	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

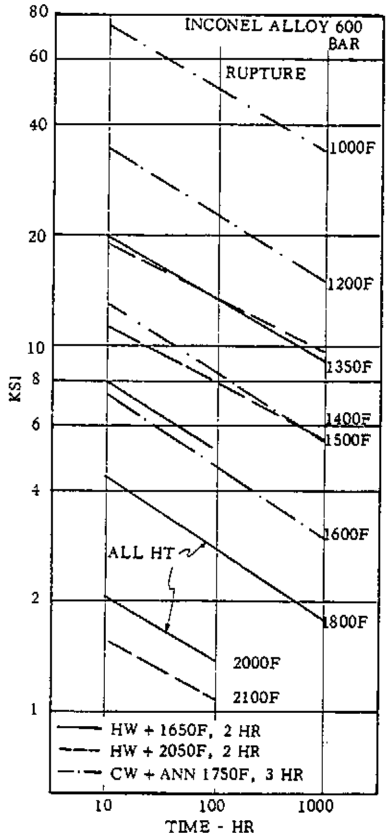

FIG. 3.042 CREEP RUPTURE CURVES FOR BAR AT 1000F TO 2100F (8, p. 12)

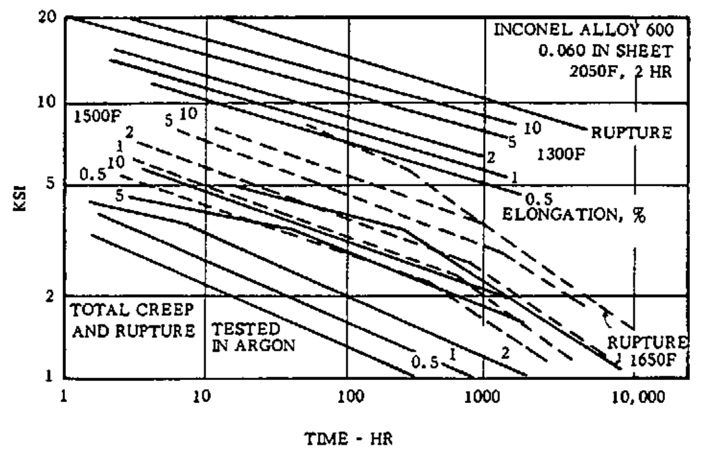

FIG. 3.044 CREEP AND STRESS-RUPTURE CURVES AT 1300 TO 1650F OF SHEET ANNEALED AT 2050F AND TESTED IN ARGON (16, p. 8, 9, 10)

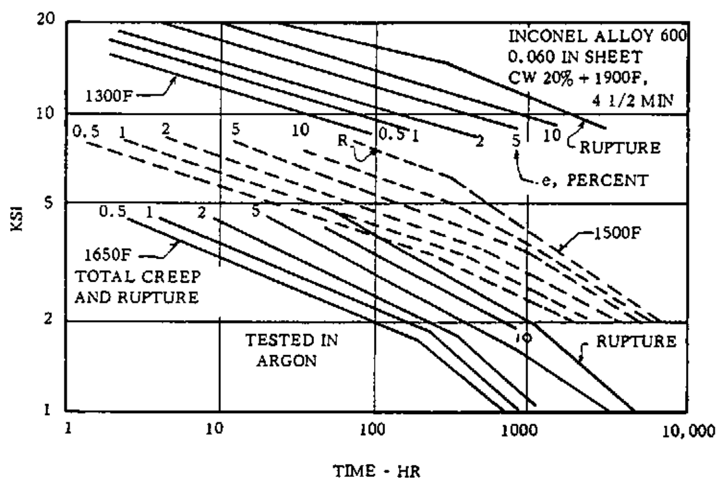

FIG. 3.043 CREEP AND STRESS-RUPTURE CURVES AT 1300 TO 1650F OF SHEET ANNEALED AT 1900F AND TESTED IN ARGON (16, p. 7, 8, 9)

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

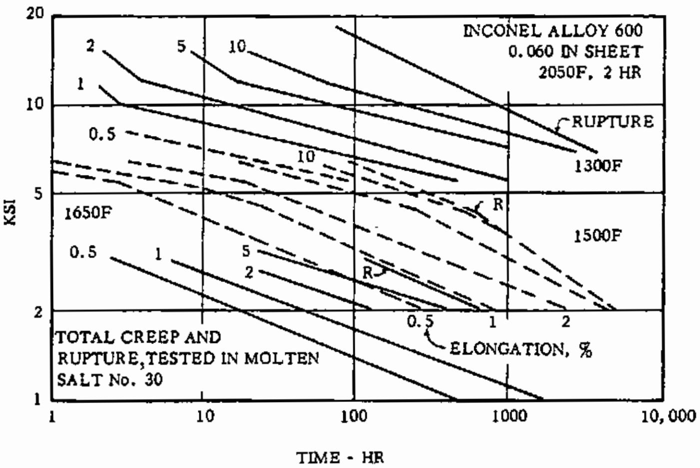

FIG. 3.045 CREEP AND STRESS-RUPTURE CURVES AT 1300 TO 1650F OF SHEET ANNEALED AT 2050F AND TESTED IN FUSED SALT No. 30 (16, p. 22, 23, 24)

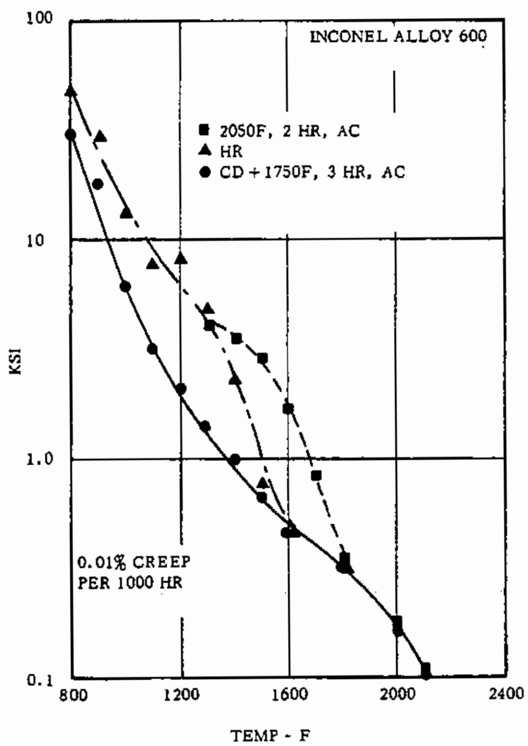

FIG. 3.046 CREEP STRESS FOR SECONDARY CREEP RATE OF 0.01 PERCENT PER 1000 HR AT TEMPERATURES FROM 800 TO 2100F (8, p. 11)

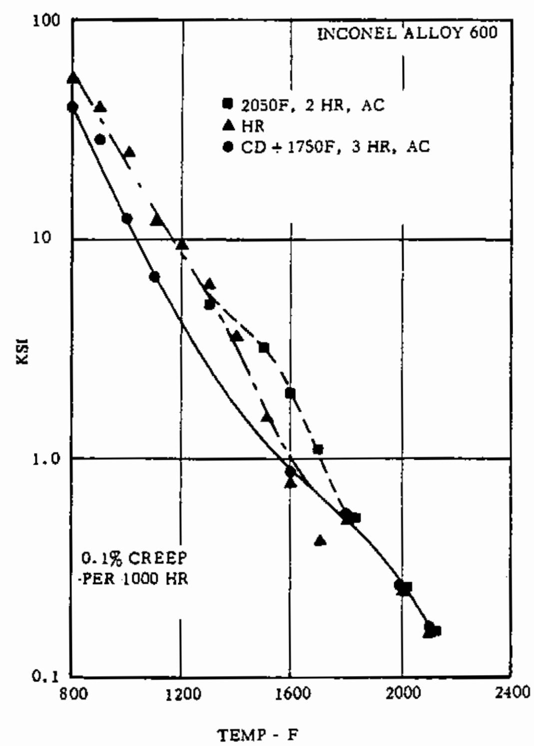

FIG. 3.047 CREEP STRESS FOR SECONDARY CREEP RATE OF 0.1 PERCENT PER 1000 HR AT TEMPERATURES FROM 800 TO 2100F (8, p. 11)

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

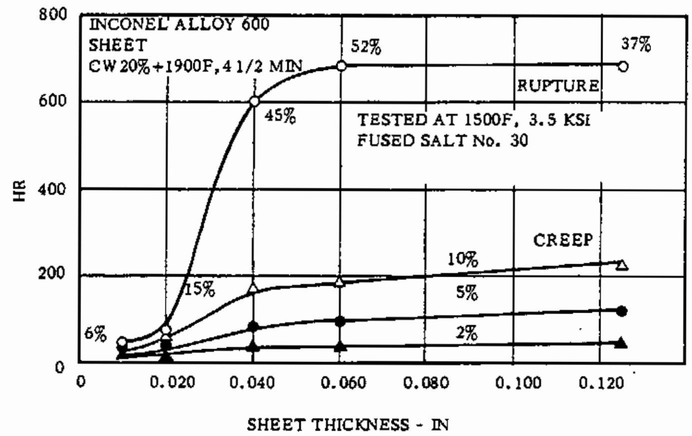

FIG. 3.048 EFFECT OF SHEET THICKNESS ON CREEP AND CREEP RUPTURE PROPERTIES IN FUSED SALT No. 30 AT 1500F UNDER 3.5 KSI (16, p. 51)

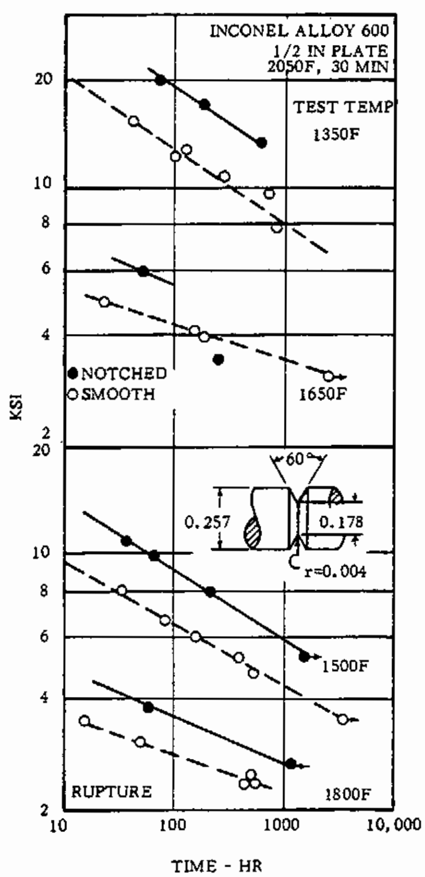

FIG. 3.049 CREEP RUPTURE CURVES FOR SMOOTH AND NOTCHED PLATE AT 1350 TO 1800F (10, p. 40)

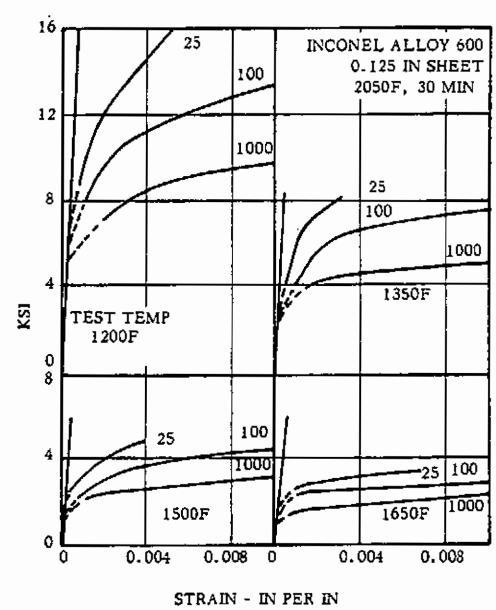

FIG. 3.0410 ISOCHRONOUS STRESS-STRAIN CURVES FOR SHEET AT 1200 TO 1650F (10, p. 43-46)

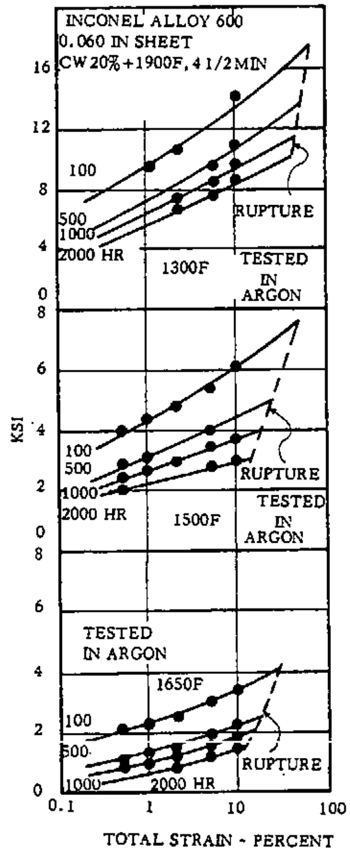

FIG. 3.0411 ISOCHRONOUS STRESS-STRAIN CURVES FOR SHEET ANNEALED AT 1900F AND TESTED IN ARGON AT TEMPERATURES FROM 1300 TO 1650F (16, p. 64, 65, 66)

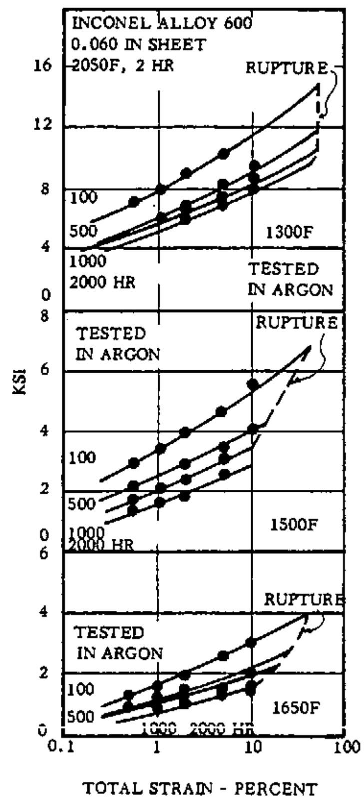

FIG. 3.0412 ISOCHRONOUS STRESS-STRAIN CURVES FOR SHEET ANNEALED AT 2050F AND TESTED IN ARGON AT TEMPERATURES FROM 1300 TO 1650F (16, p. 64, 65, 66)

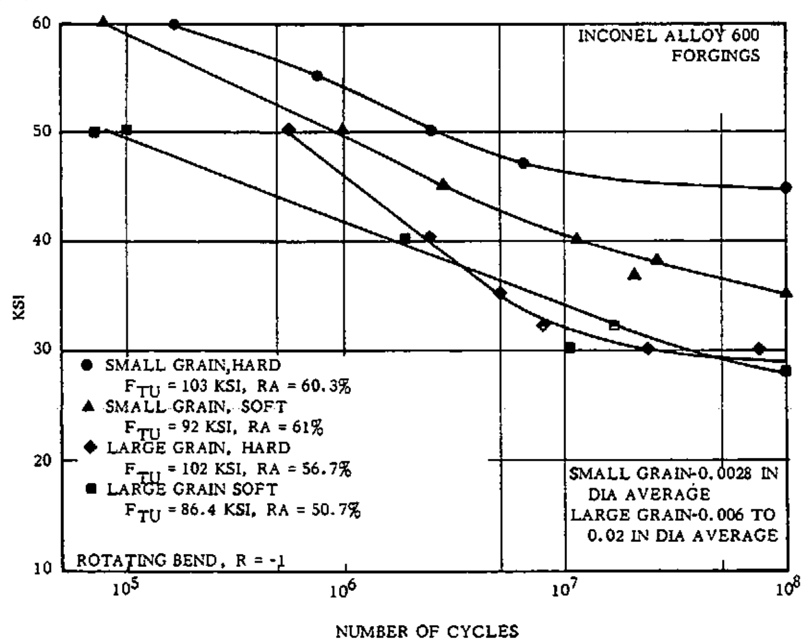

FIG. 3.052 ROTATING BEAM FATIGUE TESTS OF FORGED SPECIMENS (8, p. 9)

	Ni
15	Cr
7	Fe

INCONEL ALLOY 600

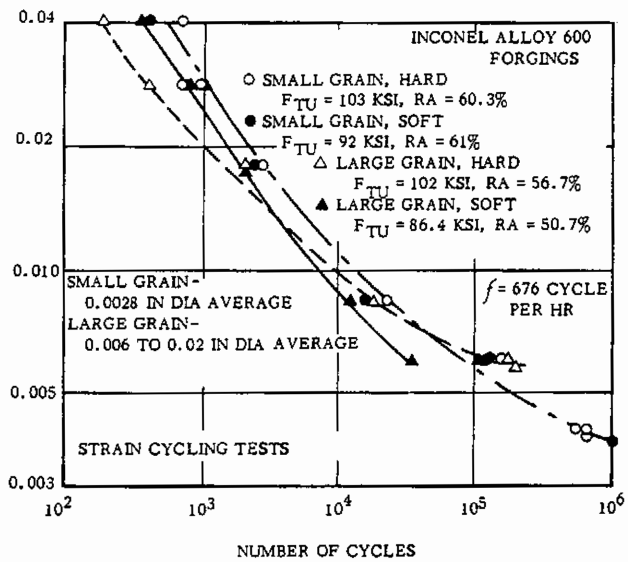

FIG. 3.053 STRAIN CYCLING FATIGUE BEHAVIOR AT ROOM TEMPERATURE OF FORGINGS MADE BY DIFFERENT PRACTICES (8, p. 9)

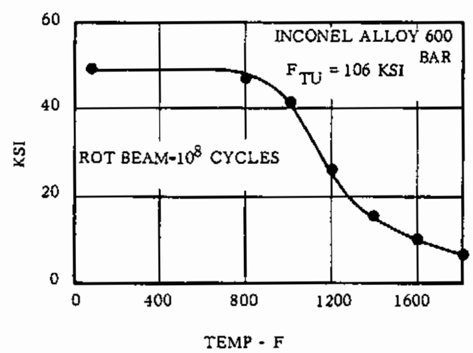

FIG. 3.054 EFFECT OF TEST TEMPERATURE ON FATIGUE STRENGTH OF BAR (8, p.8)

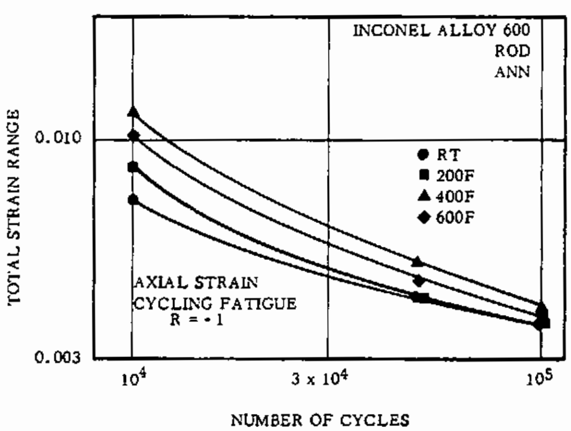

FIG. 3.055 STRAIN-CYCLING FATIGUE BEHAVIOR AT ROOM AND ELEVATED TEMPERATURES (8,p.8)(17)

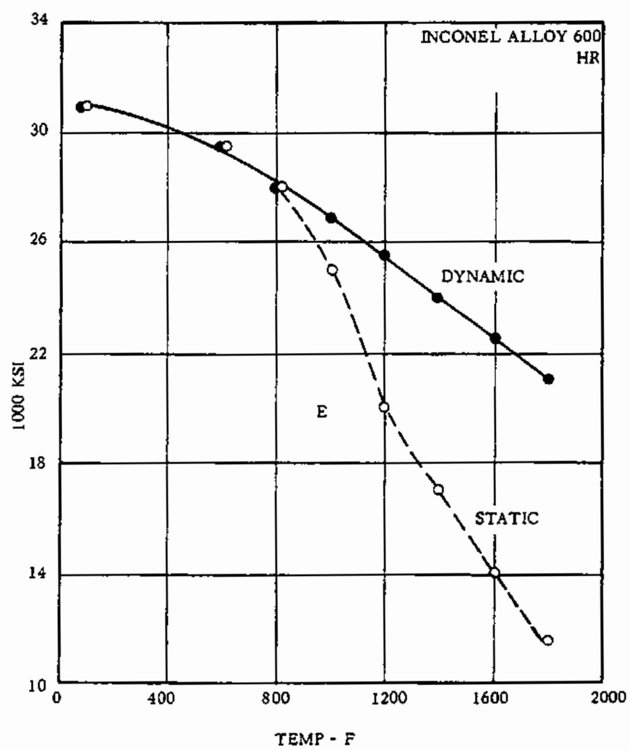

FIG. 3.062 MODULUS OF ELASTICITY AT ROOM AND ELEVATED TEMPERATURES (8, p. 10)

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