3	Mg
	Al
1	Zn

AZ31B

1. GENERAL
This nonheat treatable magnesium alloy is widely produced and used in wrought form because it has good mechanical properties along with excellent formability. Its strength deteriorates rapidly with increasing temperatures; 350 F is the maximum temperature at which it should be used. It has good weldability by inert-gas-shielded-arc techniques and also by resistance spot welding.

1.01 Commercial Designation
AZ31B.

1.02 Alternate Designation
AZ31

1.03 Specifications
Table 1.03.

TABLE 1.03

Alloy	AZ31B
Forms	Specifications
Sheet and plate	AMS 4375 F (O Condition) AMS 4377D (H24 Condition) AMS 4376C (H26 Condition) ASTM B90 MIL-F-46048 (Tread plate) MIL-T-38749 (Tooling plate) Federal QQ-M-44b SAE 510
Extrusions	ASTM B107 Federal QQ-M-31b (rods, bars, shapes) Federal WW-T-825a (tubes) SAE 510
Forgings	ASTM B91 Federal QQ-M-40b (1)

1.04 Composition
Table 1.04.

TABLE 1.04

Alloy	AZ31B			
Source	(1)(2)(3)		(4)(5)(6)	
	Percent		Percent	
Element	Minimum	Maximum	Minimum	Maximum
Aluminum	2.5	3.5	2.5	3.5
Zinc	0.7	1.3	0.6	1.4
Manganese	0.20	-	0.20	-
Silicon	-	0.10	-	0.10
Copper	-	0.05	-	0.05
Calcium	-	0.04	-	0.04
Nickel	-	0.005	-	0.005
Iron	-	0.005	-	0.005
Others, total	-	0.30	-	0.30
Magnesium	Balance		Balance	

1.05 Heat Treatment(7)
1.051 Full anneal, O condition: 650 F 1 hr, air cool.
1.052 Partial anneal after strain hardening to H24 or H26 conditions, H26 indicating a slightly higher degree of cold work: 300 F, 1 hr, air cool.
1.053 Stress relief after welding and after forming: for material in O and F conditions, 500 F 15 min, air cool; for material in H24 and H26 conditions, 300 F 1 hr, air cool.

1.06 Hardness (8)
1.061 Extrusions, F condition: BHN 49
1.062 Forgings, F condition: BHN 55

1.07 Forms and Conditions Available
Table 1.07.

TABLE 1.07

Alloy	AZ31B	
Source	(9)	
Form	Condition	Thickness - inches
Flat sheet and plate	O (fully annealed)	0.010 to 3.000
Flat sheet and plate	H24 (strain hardened and partially annealed)	0.010 to 3.000
Flat sheet and plate	H26 (strain hardened and partially annealed)	0.016 to 2.000
Coiled sheet	O	0.032 to 0.250
Coiled sheet	H24	0.032 to 0.250
Tooling plate	-	0.250 to 6.000
Extrusions	F (as extruded)	-
Forgings	F (as forged)	-

1.08 Melting and Casting Practice
AZ31B, as well as other magnesium alloys for wrought products, are normally melted and alloyed in steel crucibles under flux in gas-fired or oil-fired furnaces and cast into ingot molds up to about 28 inches in diameter.

1.09 Special Considerations
1.091 Material in the H24 and H26 conditions loses room temperature strength as a result of exposures to temperatures above 300 F, the time required for strength deterioration decreasing with increasing temperature. The maximum exposure times at various temperatures without deterioration of room temperature properties are shown in Table 1.091.

TABLE 1.091

Alloy	AZ31B
Condition	H24
Source	(10)
Maximum Time minutes	Temperature F
0.3	500
1	435
2	410
3	395
4	385
5	370
10	360
30	345
60	325

2. PHYSICAL AND CHEMICAL PROPERTIES

2.01 Thermal Properties
2.011 Melting range. 1120-1170 F (11).
2.012 Phase changes. None.
2.0121 Time-temperature-transformation diagrams.
2.013 Thermal conductivity, Figure 2.013.
2.014 Thermal expansion, Figure 2.014.
2.015 Specific heat, Figure 2.015.
2.016 Thermal diffusivity, Figure 2.016.

2.02 Other Physical Properties
2.021 Density, 0.0642 lb per cu in (9).
2.022 Electrical properties, Table 2.022.

TABLE 2.022

Alloy	AZ31B		
Condition	F, H24, O		
Source	(9)		
Temperature - F	Electrical Conductivity percent IACS	Electrical Conductivity megmhos per in^3	Electrical Resistivity microhm in
68	18.8	0.276	3.62
100	18.2	0.268	3.74
200	16.8	0.247	4.06
300	15.8	0.232	4.31
400	14.4	0.212	4.73
500	13.3	0.197	5.09

Mg
3 Al
1 Zn

AZ31B

2.023 Magnetic properties, nonmagnetic.

2.024 Emittance, Figure 2.024.

2.025 Damping capacity. At a stress equal to 0.1 F_{ty} the specific damping capacity is 6.5, which is a medium level compared with other magnesium alloys (15).

2.03 Chemical Properties

2.031 Corrosion resistance.

2.0311 AZ31B, like other magnesium alloys, is subject to corrosion (Figure 2.0311) and associated loss of strength (Table 2.0311) in industrial, marine, and moist environments. With suitable surface treatment and painting, it performs satisfactorily in all types of natural environments with the exception of continuous immersion in water (17).

TABLE 2.0311

Alloy	AZ31B				
Source	(17)				
Condition	Surface Treatment	Original Properties F_{tu} ksi	Original Properties e(2 in) percent	Percent change after 4 years in industrial atmosphere F_{tu}	Percent change after 4 years in industrial atmosphere e(2 in)
F	none	51.6	11.8	-15	-16
O	none	36.0	22.2	-19	-15
H24	none	41.3	27.2	-13	-25
H26	none	44.1	12.7	-17	-45
H26	chrome pickle	45.2	9.5	-17	-37

2.0312 Magnesium alloys, in general, have the highest electronegative potential of the common structural metals, and they exhibit only a slight tendency to polarize anodically in salt solutions. As a result, AZ31B as well as other magnesium alloys in electrical contact with other metals can suffer severe galvanic corrosion in moist environments unless one or more of the following preventive measures are taken:

a. A dissimilar metal with galvanic compatability with magnesium is selected.
b. Suitable protective treatments are applied.
c. A device is used to increase the resistance of the galvanic cell.
d. The galvanic cell is inhibited by chemical means.

Generally, the copper containing aluminum alloys are not compatible with magnesium nor are those containing high amounts of iron impurity. Mild steel, stainless steel, titanium, copper, monel, and similar materials are not compatible and will corrode magnesium alloys galvanically. Some dissimilar metals considered to be compatible with magnesium alloys are high purity aluminum and alloys 5052, 5053, 5056, 6061, and 6063 (8)(17).

2.0313 AZ31B and other magnesium alloys are subject to stress corrosion in air, fresh water, sea water, and many other salt solutions. The threshold stress, rate of crack growth, and time to failure vary widely with the environment. AZ31B sheet in the H24 and H26 conditions are more resistant than the annealed material. Stress relief after forming and welding is very important in minimizing stress-corrosion cracking (18)(19).

2.032 Safety precautions should be directed to the prevention of fires, burns, and explosions (see HZ32A, Code 3408, Section 2.032).

2.04 Nuclear Properties

3. MECHANICAL PROPERTIES

3.01 Specified Mechanical Properties
Table 3.01.

TABLE 3.01

Alloy	AZ31B							
Condition	Form	Source	Thickness or Diameter - in	Specimen Orientation	F_{tu} ksi	F_{ty}-ksi min	e(2 in) min	F_{cy}-ksi min
O	sheet and plate	(1)	0.016-0.060	tension not specified, compression longitudinal	32-40	18	12	-
			0.060-0.500		32-40	15	12	-
			0.063-0.249		-	-	-	12
			0.249-2.000		-	-	-	10
			0.500-2.000		32-40	15	10	-
			2.000-3.000		32-40	15	9	8
H24	sheet and plate	(3)		tension not specified, compression longitudinal	F_{tu}-ksi min			
			0.016-0.249		39	29	6	-
			0.063-0.249		-	-	-	24
			0.249-0.374		38	26	8	20
			0.374-0.500		37	24	8	16
			0.500-1.000		36	22	8	13
			1.000-2.000		34	20	8	10
			2.000-3.000		34	18	8	9
H26	sheet and plate	(2)	0.250-0.374	tension not specified, compression longitudinal	39	27	6	22
			0.374-0.438		-	-	-	21
			0.438-0.500		-	-	-	18
			0.374-0.500		38	26	6	-
			0.500-0.750		37	25	6	17
			0.750-1.000		37	23	6	16
			1.000-1.500		35	22	6	15
			1.500-2.000		35	21	6	14
F	extruded bars, rods, and shapes	(6)	up to 0.249	longitudinal	35	21	7	-
			0.250-1.499		35	22	7	-
			1.500-2.499		34	22	7	-
			2.500-4.999		32	20	7	-
	extruded tubes and hollow shapes	(6)	0.028-0.250	longitudinal	32	16	8	-
			0.251-0.750		32	16	4	-
	forgings	(7)	all	longitudinal	34	19	6	-

3.02 Mechanical Properties at Room Temperature

3.021 Tension.

3.0211 Stress-strain diagrams (see Figures 3.03111, 3.03112, and 3.03113).

3.0212 Effect of thickness on tensile properties of sheet and plate, Figure 3.0212.

3.0213 Effect of exposures at elevated temperatures on tensile properties at room temperature of sheet in H24 condition, Figure 3.0213.

3.0214 Effect of rolling temperature on the tensile properties of sheet rolled to 20 percent reduction, Figure 3.0214.

	Mg
3	Al
1	Zn

AZ31B

3.0215 Effect of rolling temperature on the tensile properties of sheet rolled to 40 percent reduction, Figure 3.0215.

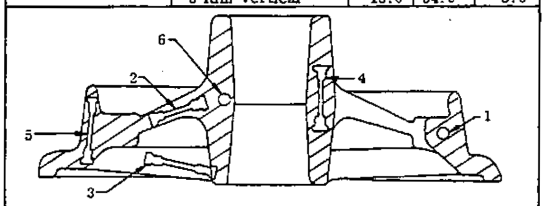
3.0216 Typical tensile properties of extrusions in F condition in section sizes up to 5.0 inches
F_{tu} = 38.0 ksi F_{ty} = 28.5 ksi e(2 in) = 14.5 (9).

3.0217 Typical tensile properties of forgings in F condition
F_{tu} = 38.0 ksi F_{ty} = 28.0 ksi e(2 in) = 9.0 (9).

3.0218 Tensile properties at various locations in brake wheel forging in different conditions, Table 3.0218.

TABLE 3.0218

Alloy	AZ31B			
Form	20.5 lb Brake Wheel Forging			
Source	(21)			
Condition	Test Location	F_{ty}-ksi	F_{tu}-ksi	e(2 in)
As hot forged	1 Rim Tangential	25.9	39.3	18.0
	6 Center Tangential	23.7	38.1	18.4
	2 Radial	21.1	37.8	18.0
	3 Radial	24.5	38.2	16.6
	4 Center Vertical	14.8	35.9	18.0
	5 Rim Vertical	17.1	36.2	11.6
Hot forged and cold finished	1 Rim Tangential	29.0	40.6	16.6
	6 Center Tangential	27.2	41.4	17.6
	2 Radial	28.4	40.5	18.0
	3 Radial	23.3	38.8	15.2
	4 Center Vertical	21.7	37.2	12.2
	5 Rim Vertical	17.9	36.3	9.2
Hot forged and aged 48 hours at 300F	1 Rim Tangential	30.0	39.7	14.0
	6 Center Tangential	24.8	38.7	16.0
	2 Radial	23.8	38.3	13.0
	3 Radial	25.9	36.7	9.0
	4 Center Vertical	15.1	36.7	15.0
	5 Rim Vertical	20.4	34.6	14.0
Hot forged, cold finished, and aged 48 hours at 300F	1 Rim Tangential	28.5	39.9	15.0
	6 Center Tangential	29.8	39.7	15.0
	2 Radial	28.1	40.3	15.0
	3 Radial	26.7	37.7	8.0
	4 Center Vertical	20.4	36.1	14.0
	5 Rim Vertical	18.0	34.0	8.0



3.0219 Effect of orientation and forging reduction on tensile properties of roll forged rings, Table 3.0219.

TABLE 3.0219

Alloy	AZ31B			
Condition	F			
Form	Roll Forged			
Source	(22)			
Specimen Orientation	Forging Reduction percent	F_{tu} - ksi	F_{ty} - ksi	e(2 in) percent
Tangential	20	32	24	9
	40	36	26	11
	60	37	27	11
Axial	20	34	15	12
	40	34	20	12
	60	36	23	12
Radial	20	32	9	11
	40	36	9	13
	60	39	12	15

3.022 Compression.

3.0221 Stress-strain diagrams (see Figures 3.03211 and 3.03212).

3.0222 Effect of thickness on compressive yield strength of sheet and plate, Figure 3.0222.

3.0223 Effect of exposures at elevated temperatures on compressive yield strength at room temperature of sheet in H24 condition, Figure 3.0223.

3.0224 Typical compressive strength of extrusions in F condition in section sizes up to 5.0 inches
F_{cy} = 14.2 ksi (9).

3.0225 Typical compressive strength of forgings in F condition
F_{cy} = 12 ksi (9).

3.0226 Effect of orientation and forging reduction on compressive strength of roll forged rings, Table 3.0226.

TABLE 3.0226

Alloy	AZ31B	
Condition	F	
Form	Roll Forged	
Source	(22)	
Specimen Orientation	Forging Reduction - percent	F_{cy} ksi
Tangential	20	12
	40	12
	60	12
Axial	20	11
	40	11
	60	11
Radial	20	14
	40	14
	60	18

3.023 Impact (see Figure 3.0331).

3.024 Bending.

3.025 Torsion and shear.

3.0251 Effect of thickness on shear strength of sheet and plate, Figure 3.0251.

3.0252 Typical shear strength of extrusions in F condition in sections up to 5.0 inches: F_{su} = 19 ksi (9).

3.0253 Typical shear strength of forgings in F condition:
F_{su} = 19 ksi (9).

3.026 Bearing.

3.0261 Effect of thickness on bearing properties of sheet and plate, Figure 3.0261.

3.0262 Typical bearing (e/d = 2.5) properties of extrusions in F condition in sections up to 5.0 inches: F_{bru} = 56 ksi F_{bry} = 34 ksi (9).

3.0263 Typical bearing (e/d = 2.5) properties of forgings in F condition: F_{bru} = 70 ksi F_{bry} = 36 ksi (9).

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.

3.03111 Effects of elevated temperature exposure on stress-strain curves for sheet in O condition, Figure 3.03111.

3.03112 Effects of elevated temperature exposure on stress-strain curves for sheet in H24 condition, Figure 3.03112.

3.03113 Complete stress-strain curves at low temperatures, Figure 3.03113.

3.0312 Elevated temperature tensile properties of sheet in H24 condition after various exposure times from one half to 1000 hours at temperature, Figure 3.0312.

3.0313 Low temperature properties of sheet tensile specimens in H24 condition, both unwelded and with gas tungsten arc butt welds transverse to the gage length, Figure 3.0313.

3.0314 Effects of temperature on tensile properties of sheet in H24 condition at rapid strain rates after rapid heating and short holding times at temperature, Figure 3.0314.

3.0315 Effects of strain rate on tensile properties of sheet in H24 condition at various temperatures, Figure 3.0315.

3.0316 Effects of strain rate on tensile properties of sheet in O condition at various temperatures, Figure 3.0316.

	Mg
3	Al
1	Zn

AZ31B

3.0317 Effects of strain rate on tensile properties of extrusions in F condition at various temperatures, Figure 3.0317.
3.0318 Low temperature tensile properties of extrusions and sheet, Figure 3.0318.
3.0319 Elevated temperature tensile strength of extrusions, Figure 3.0319.
3.032 Compression.
3.0321 Stress-strain diagrams.
3.03211 Effect of elevated temperature exposure on stress-strain curves in compression for sheet in O condition, Figure 3.03211.
3.03212 Effect of elevated temperature exposure on stress-strain curves in compression for sheet in H24 condition, Figure 3.03212.
3.0322 Elevated temperature compressive yield strength, Figure 3.0322.
3.033 Impact.
3.0331 Charpy impact properties at low temperatures, Figure 3.0331.
3.034 Bending.
3.035 Torsion and shear.
3.0351 Effect of temperature and exposure time on shear strength, Figure 3.0351.
3.036 Bearing.
3.0361 Effects of temperature and exposure time on bearing properties, Figure 3.0361.
3.037 Stress concentration.
3.0371 Notch properties.
3.0372 Fracture toughness.
3.038 Combined properties.

3.04 Creep and Creep Rupture Properties
3.041 Total creep strain curves for sheet in O condition, Figure 3.041.
3.042 Total creep strain curves for sheet in H24 condition, Figure 3.042.
3.043 Total creep strain curves for extrusions in F condition, Figure 3.043.
3.044 Short time total strain curves at 300 to 600F for sheet in H24 condition, Figure 3.044.

3.05 Fatigue Properties
3.051 Fatigue strength of extrusions and sheet, Table 3.051.

TABLE 3.051

Source	(32)								
Form	(a) Extrusions (b) Sheet								
Condition	Temp F	Method	Stress Ratio A	Stress Ratio R	Stress Concentration	Fatigue Strength - ksi at Cycles 10^5	10^6	10^7	10^8
(a) F	RT	Rot beam	∞	-1	Smooth $K_t = 1$	23 to 29	21 to 26	19 to 23	17 to 21
(b) O		Rev bend	∞	-1	As rolled	18 to 22	15 to 17	14 to 16	-
(b) H24						19 to 25	16 to 20	14 to 17	-
(a) F	RT	Direct stress	0.60	0.25	Smooth $K_t = 1$	23 to 28	22 to 25	20 to 24	-
(b) O					As rolled	20 to 24	19 to 22	18 to 21	-
(b) H24					As rolled	22 to 27	20 to 24	19 to 23	-
Source	(33)								
(a) H24	RT	Rot beam	∞	-1	Smooth $K_t = 1$	24.3	22	19	-
	-320 F					32.7	28	25	-
	RT				Notched $K_t = 3.4$	14	10	8	-
	-320 F					16.5	12	10	-

3.052 Stress-range diagrams for sheet in the O and H24 conditions, Figure 3.052.
3.053 Stress range diagram for forgings at 90 percent survival level, Figure 3.053.

3.06 Elastic Properties
3.061 Poisson's ratio. 0.35 (9).
3.062 Modulus of elasticity, Figure 3.062.
3.063 Modulus of rigidity. 2.4×10^3 ksi.
3.064 Tangent modulus curves in compression for sheet in O condition, Figure 3.064.
3.065 Tangent modulus curves in compression for sheet in H24 condition, Figure 3.065.

4. FABRICATION
4.01 Formability.
4.011 AZ31B is one of the most formable of the magnesium alloys. The methods and equipment used are the same type commonly used for other metals. Like other magnesium alloys, the room temperature formability of AZ31B is limited to relatively mild deformation around generous radii. It becomes very workable at elevated temperatures, optimum formability being achieved at temperatures above 400F. The formability at 400 to 600F is so improved that more severe working is possible in this temperature range, in most operations, than in most other metals at room temperature. In order to prevent deterioration in strength during hot forming operations, it is important not to exceed established temperature limits as given in Table 4.011. Stress relieving, as given in section 1.053, is recommended to reduce residual stresses induced by cold and hot forming (7)(9)(10)(37)(38).

TABLE 4.011

Alloy	AZ31B		
Source	(37)(10)		
Condition	Form	Max Forming Temp - F	Max Time at Temp - hr
H24	Sheet and plate	300*	1
O	Sheet and plate	550	1
F	Extrusions	550	1

* Higher temperatures may be used with shorter maximum times at temperature as shown in Table 1.091

4.02 Machining and Grinding
4.021 This alloy, like other magnesium alloys has exceptionally good machinability, which enables it to be machined at high speeds and feeds. For further details, see HZ32A, Code 3408, Section 4.021.
4.022 The alloy can be chem-milled with sulfuric, nitric, or by hydrochloric acid of 5 percent strength or greater (39).

4.03 Welding
4.031 AZ31B has excellent weldability by arc and electric-resistance methods. In arc welding the arc should be shielded with argon or helium gas, and either tungsten or consumable electrodes may be used. AZ92A and AZ61A magnesium alloys are suitable filler metals. Electric-resistance welding methods that may be used include spot, seam, and flash welding. Spot welding is used to the greatest extent. Joining methods other than spot welding should be used in applications that involve vibrating stresses. Fusion welded, riveted, bolted, and adhesive bonded joints all have fatigue strength superior to spot welded joints. Welded parts should be stress relieved in accordance with the procedure in section 1.053 for the following reasons: (9)(40)

a. to prevent stress corrosion cracking
b. to obtain a stress-free assembly
c. to facilitate sizing and straightening
d. to provide dimensional stability

Some properties of welded joints are shown in Figure 3.0313.

4.04 Surface Treatment
4.041 The various wrought products are normally oiled by the producer with a light corrosion inhibiting oil for protection during shipment and storage (1)(2)(3).
4.042 See HZ32A, Code 3408, section 4.042 and 4.043.

	Mg
3	Al
1	Zn

AZ31B

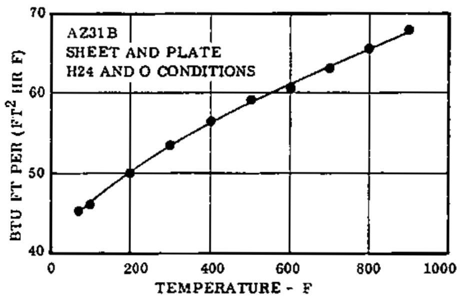


FIG. 2.013 THERMAL CONDUCTIVITY. (9)

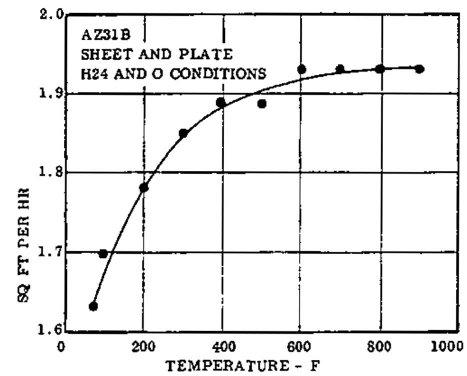


FIG. 2.016 THERMAL DIFFUSIVITY. (9)

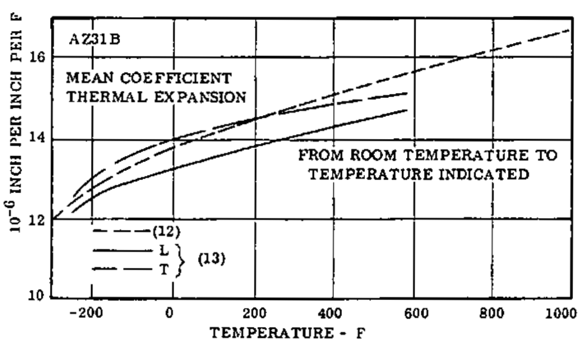


FIG. 2.014 THERMAL EXPANSION. (12)(13)

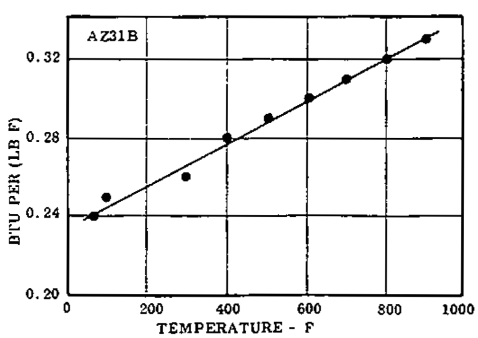


FIG. 2.015 SPECIFIC HEAT. (9)

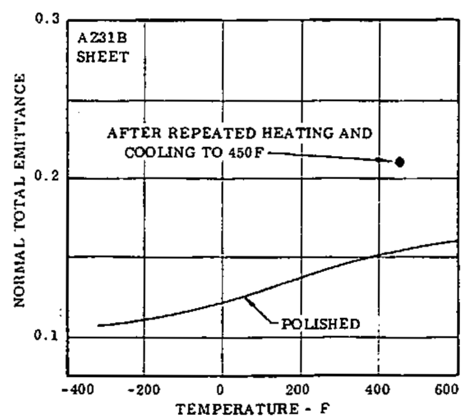


FIG. 2.024 TOTAL NORMAL EMITTANCE. (14)

	Mg
3	Al
1	Zn

AZ31B

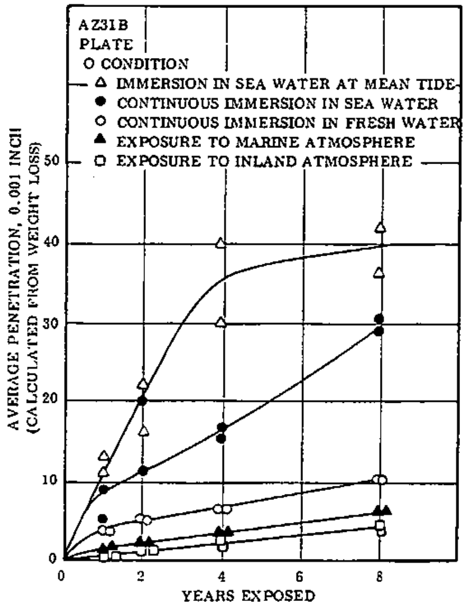


FIG. 2.0311 CORROSION IN VARIOUS ENVIRONMENTS. (16)

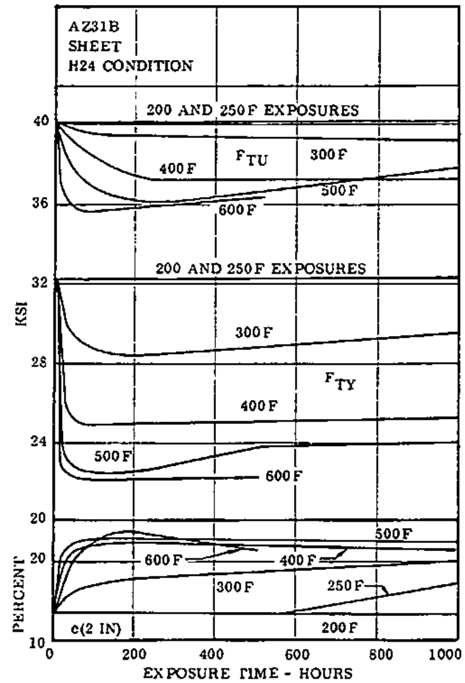


FIG. 3.0213 EFFECT OF EXPOSURES AT ELEVATED TEMPERATURES ON TENSILE PROPERTIES AT ROOM TEMPERATURE OF SHEET IN H24 CONDITION. (9)

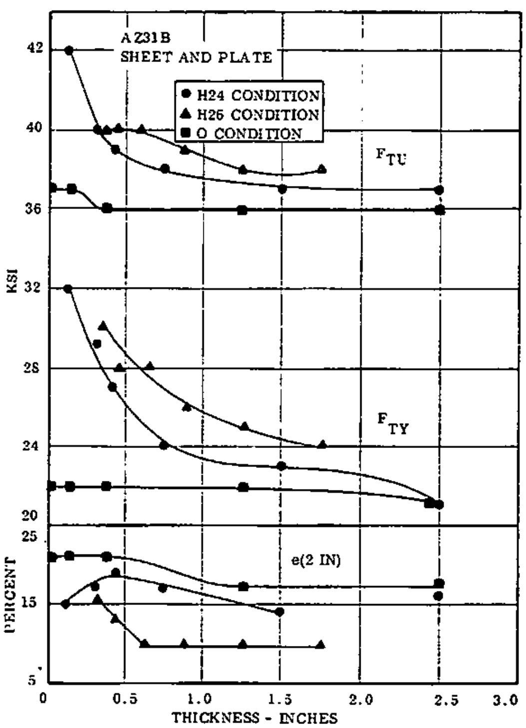


FIG. 3.0212 EFFECT OF THICKNESS ON TENSILE PROPERTIES OF SHEET AND PLATE. (9)

NOTE: Data are based on the lowest strength orientation whether longitudinal or transverse.

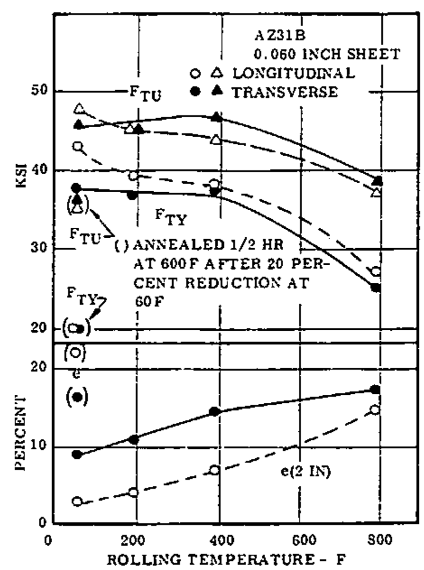


FIG. 3.0214 EFFECT OF ROLLING TEMPERATURE ON THE TENSILE PROPERTIES OF SHEET ROLLED TO 20 PERCENT REDUCTION. (20)

	Mg
3	Al
1	Zn

AZ31B

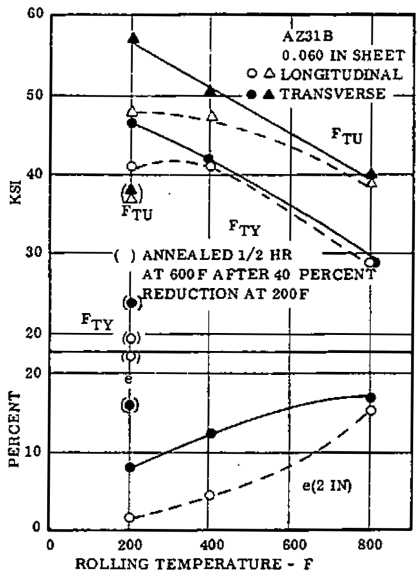


FIG. 3.0215 EFFECT OF ROLLING TEMPERATURE ON THE TENSILE PROPERTIES OF SHEET ROLLED TO 40 PERCENT REDUCTION. (20)

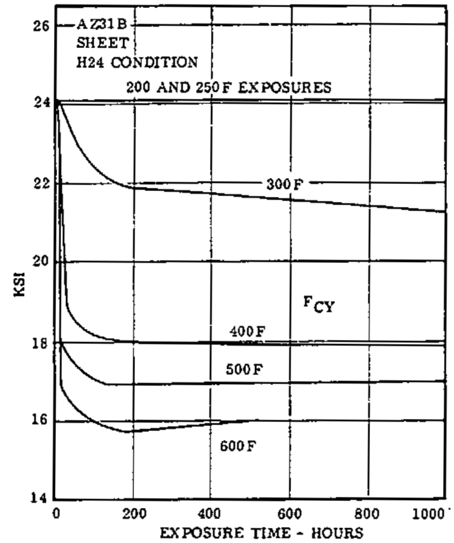


FIG. 3.0223 EFFECT OF EXPOSURES AT ELEVATED TEMPERATURES ON COMPRESSIVE YIELD STRENGTH AT ROOM TEMPERATURE OF SHEET IN H24 CONDITION. (9)

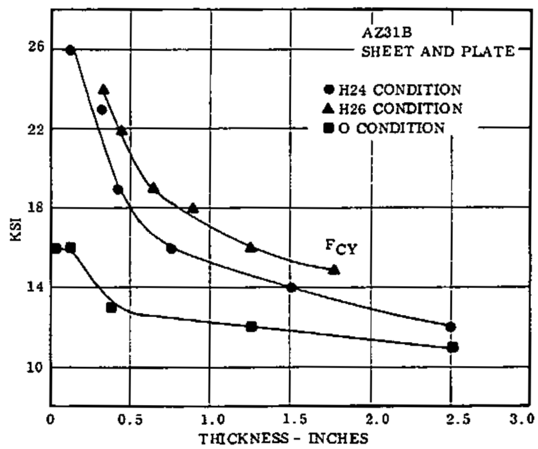


FIG. 3.0222 EFFECT OF THICKNESS ON COMPRESSIVE YIELD STRENGTH OF SHEET AND PLATE. (9)

NOTE: Data are based on the lower strength orientation whether longitudinal or transverse.

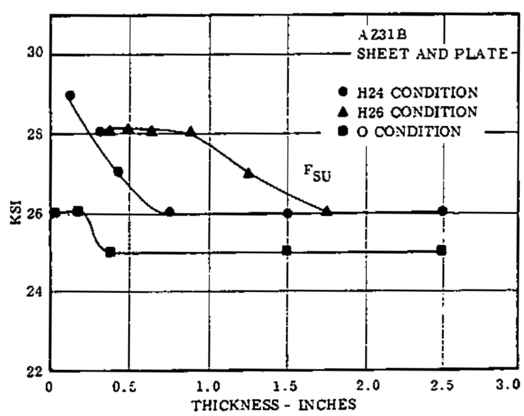


FIG. 3.0251 EFFECT OF THICKNESS ON SHEAR STRENGTH OF SHEET AND PLATE. (9)

NOTE: Data are based on the lower strength orientation whether longitudinal or transverse.

	Mg
3	Al
1	Zn

AZ31B

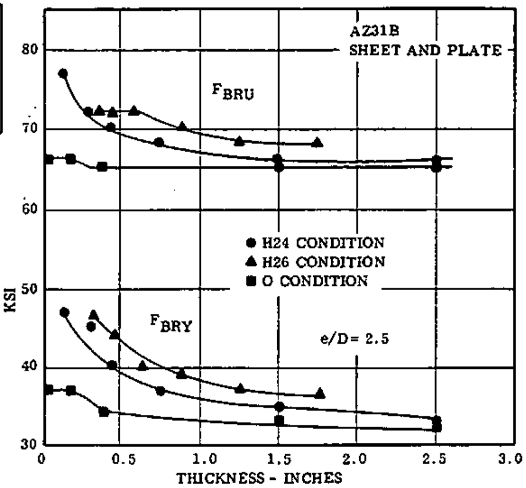


FIG. 3.0261 EFFECT OF THICKNESS ON BEARING PROPERTIES OF SHEET AND PLATE. (9)

NOTE: Data are based on the lower strength orientation whether longitudinal or transverse.

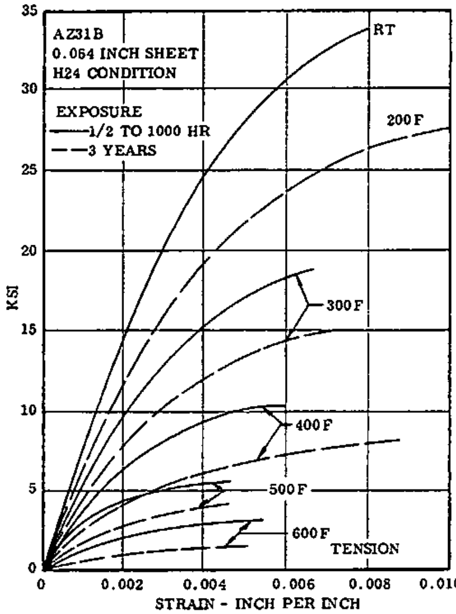


FIG. 3.03112 EFFECT OF ELEVATED TEMPERATURE EXPOSURE ON STRESS-STRAIN CURVES FOR SHEET IN H24 CONDITION. (24)(25)

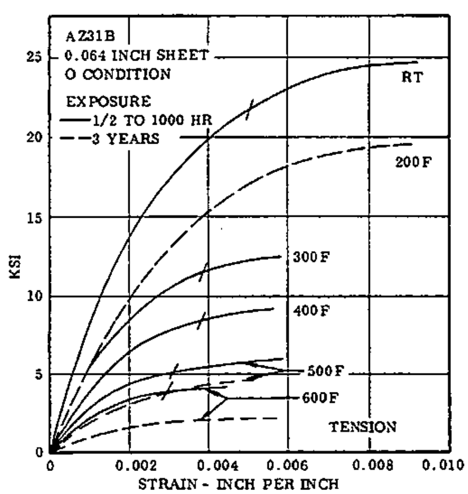


FIG. 3.03111 EFFECT OF ELEVATED TEMPERATURE EXPOSURE ON STRESS-STRAIN CURVES FOR SHEET IN O CONDITION. (23)(24)

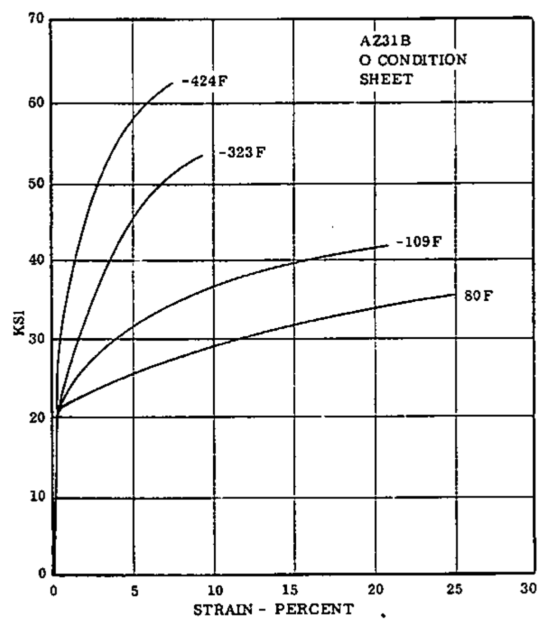


FIG. 3.03113 COMPLETE STRESS-STRAIN CURVES AT LOW TEMPERATURES. (26)

	Mg
3	Al
1	Zn

AZ31B

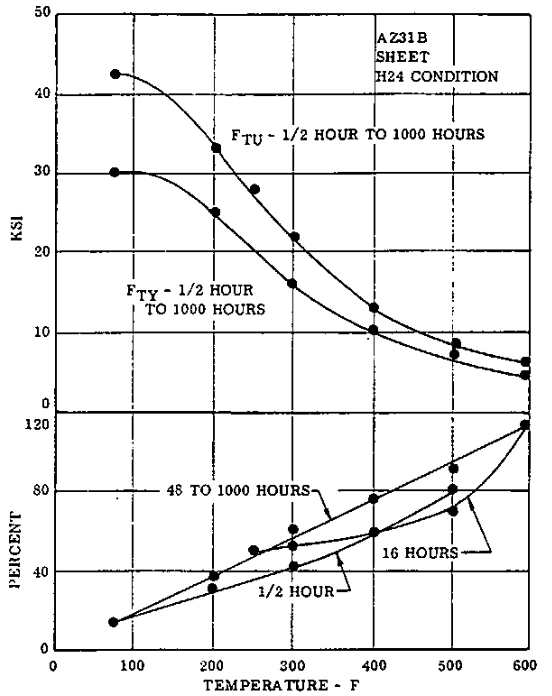


FIG. 3.0312 ELEVATED TEMPERATURE TENSILE PROPERTIES OF SHEET IN H24 CONDITION AFTER VARIOUS EXPOSURE TIMES FROM ONE HALF TO 1000 HOURS AT TEMPERATURE. (9)(27)

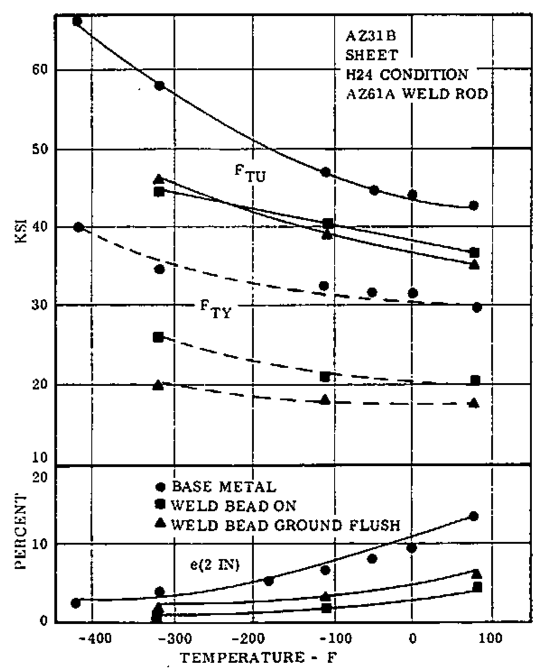


FIG. 3.0313 LOW TEMPERATURE PROPERTIES OF SHEET TENSILE SPECIMENS IN H24 CONDITION, BOTH UNWELDED AND WITH GAS TUNGSTEN-ARC BUTT WELDS TRANSVERSE TO THE GAGE LENGTH. (9)(27)

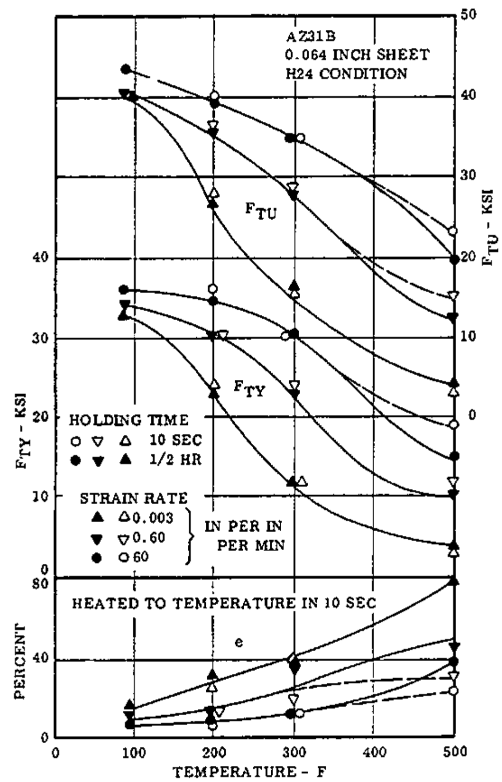


FIG. 3.0314 EFFECTS OF TEMPERATURE ON TENSILE PROPERTIES OF SHEET IN H24 CONDITION AT RAPID STRAIN RATES AFTER RAPID HEATING AND SHORT HOLDING TIMES AT TEMPERATURE. (28)

	Mg
3	Al
1	Zn

AZ31B

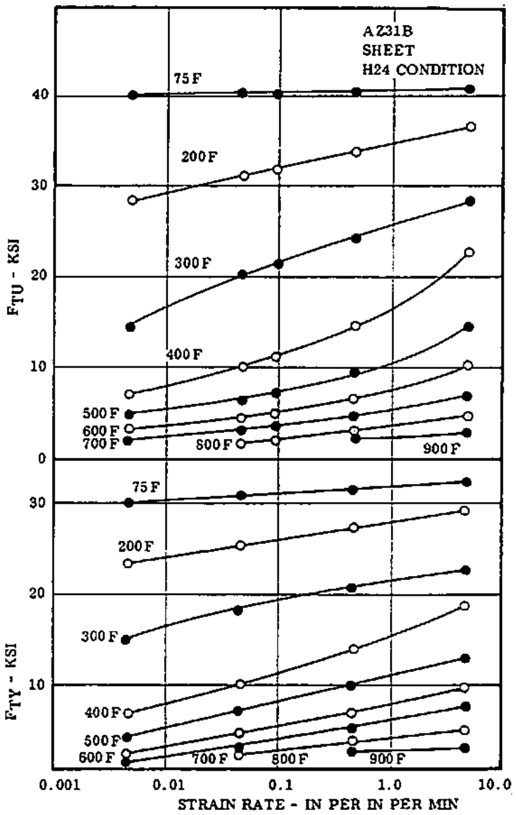


FIG. 3.0315 EFFECTS OF STRAIN RATE ON TENSILE PROPERTIES OF SHEET IN H24 CONDITION AT VARIOUS TEMPERATURES. (9)

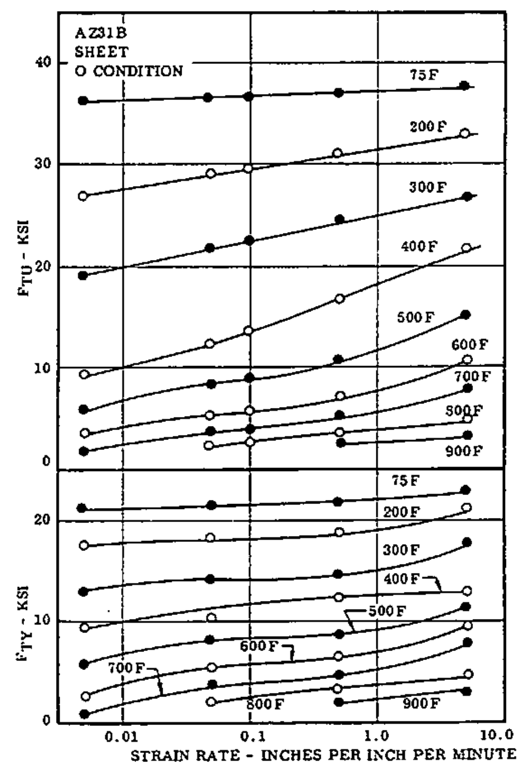


FIG. 3.0316 EFFECTS OF STRAIN RATE ON TENSILE PROPERTIES OF SHEET IN O CONDITION AT VARIOUS TEMPERATURES. (9)

	Mg
3	Al
1	Zn

AZ 31B

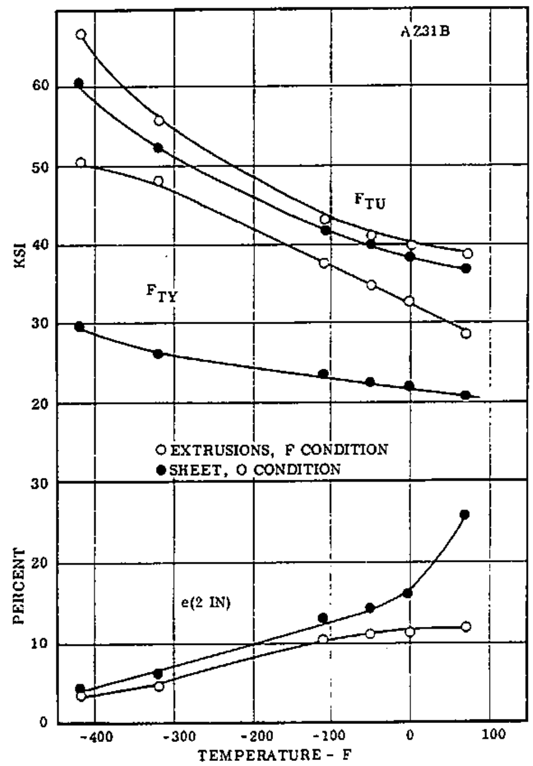


FIG. 3.0318 LOW TEMPERATURE TENSILE PROPERTIES OF EXTRUSIONS AND SHEET. (9)

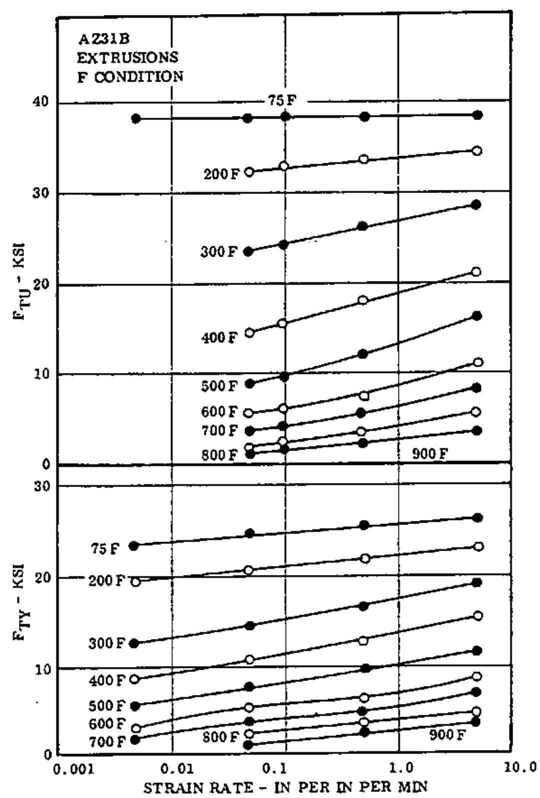


FIG. 3.0317 EFFECTS OF STRAIN RATE ON TENSILE PROPERTIES OF EXTRUSIONS IN F CONDITION AT VARIOUS TEMPERATURES. (9)

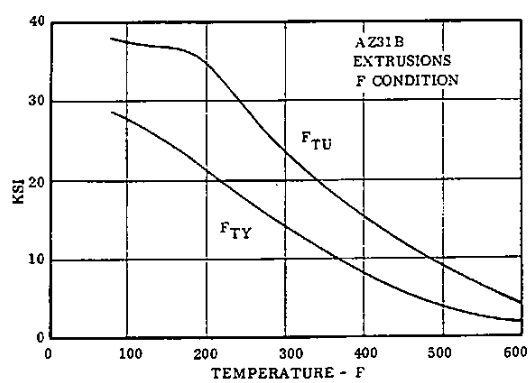


FIG. 3.0319 ELEVATED TEMPERATURE TENSILE STRENGTH OF EXTRUSIONS. (9)

	Mg
3	Al
1	Zn

AZ31B

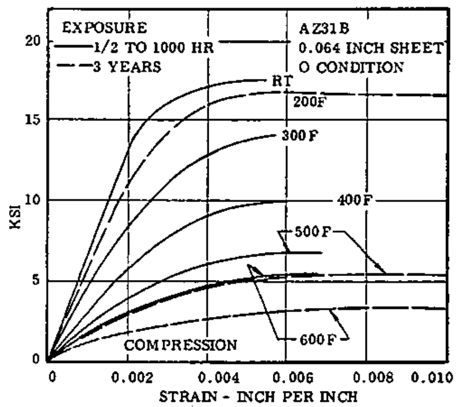


FIG. 3.03211 EFFECT OF ELEVATED TEMPERATURE EXPOSURE ON STRESS-STRAIN CURVES IN COMPRESSION FOR SHEET IN O CONDITION. (23)(24)

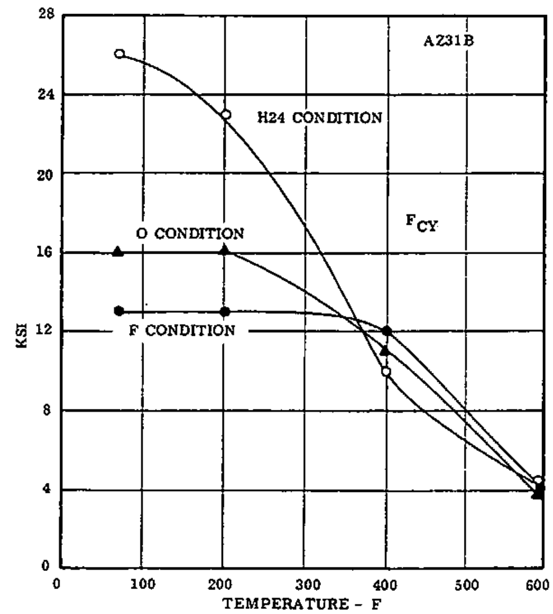


FIG. 3.0322 ELEVATED TEMPERATURE COMPRESSIVE YIELD STRENGTH. (29)

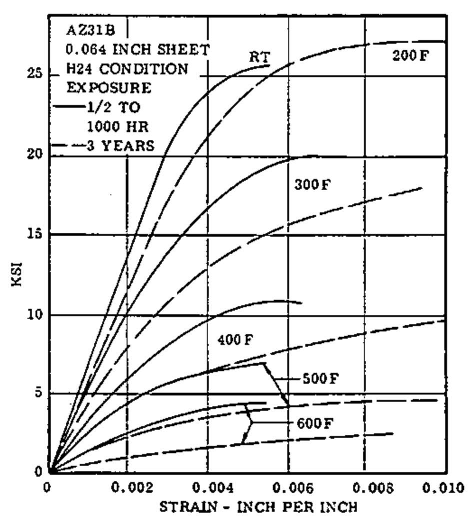


FIG. 3.03212 EFFECT OF ELEVATED TEMPERATURE EXPOSURE ON STRESS-STRAIN CURVES IN COMPRESSION FOR SHEET IN H24 CONDITION. (24)(25)

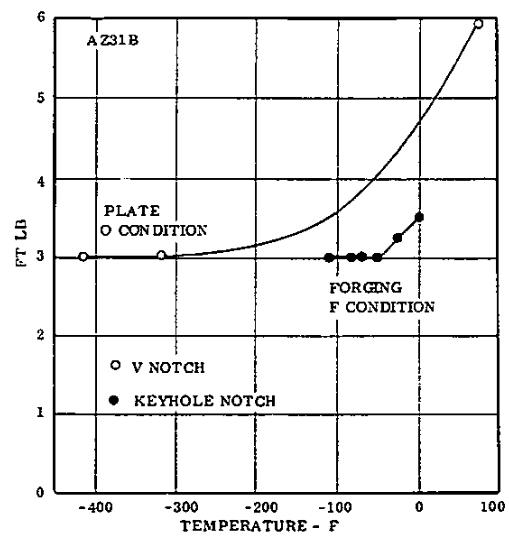


FIG. 3.0331 CHARPY IMPACT PROPERTIES AT LOW TEMPERATURES. (26)(29)

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	Mg
3	Al
1	Zn

AZ31B

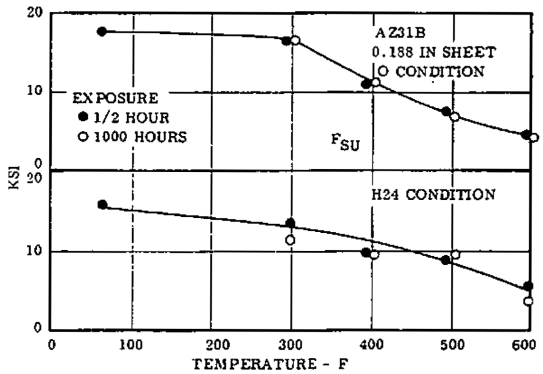

FIG. 3.0351 EFFECT OF TEMPERATURE AND EXPOSURE TIME ON SHEAR STRENGTH. (23)(30)

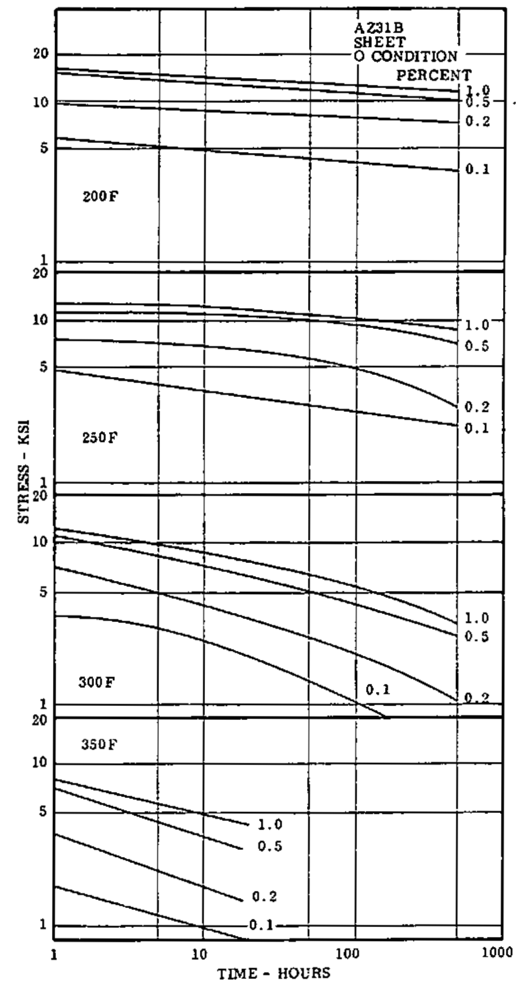

FIG. 3.041 TOTAL CREEP STRAIN CURVES FOR SHEET IN O CONDITION. (9)

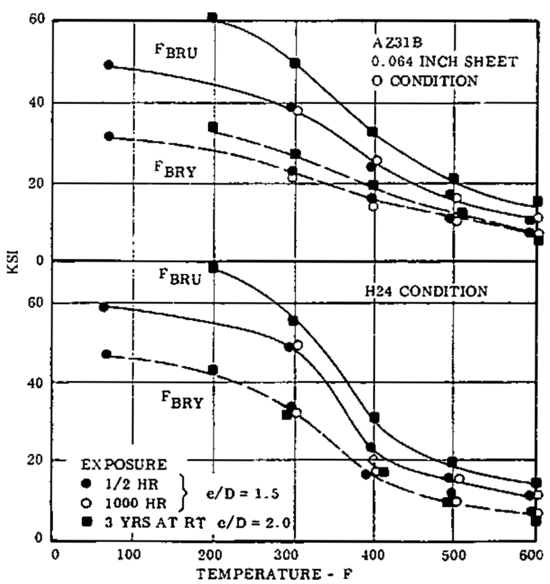

FIG. 3.0361 EFFECT OF TEST TEMPERATURES AND EXPOSURE TIME ON BEARING PROPERTIES. (23)(24)(30)

	Mg
3	Al
1	Zn

AZ31B

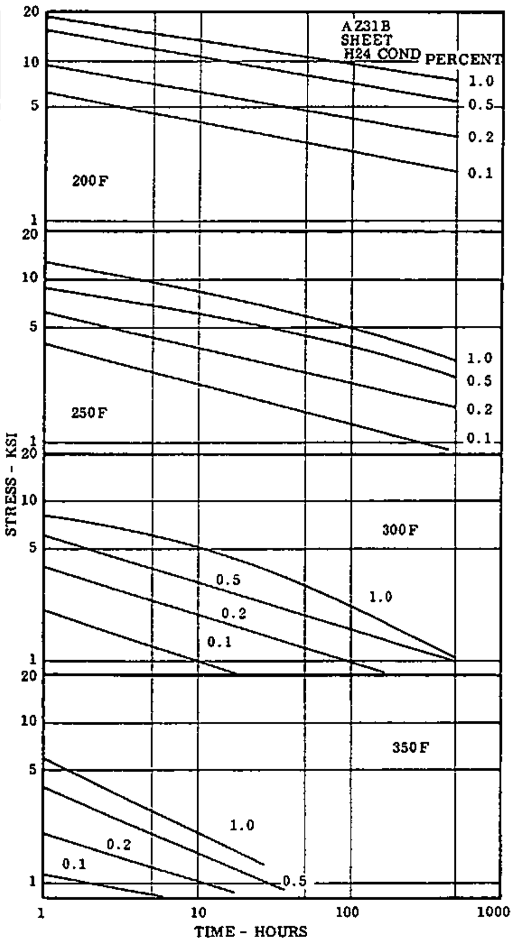

FIG. 3.042 TOTAL CREEP STRAIN CURVES FOR SHEET IN H24 CONDITION. (9)

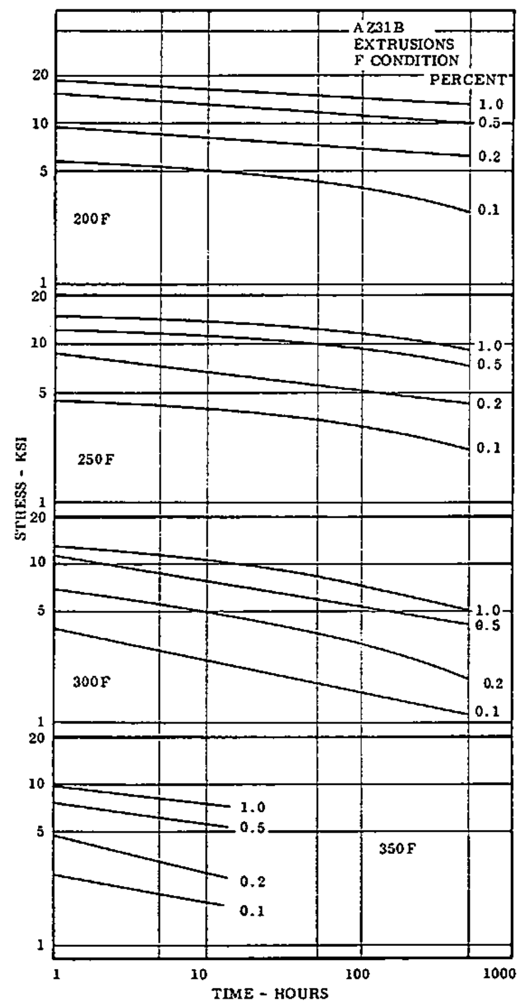

FIG. 3.043 TOTAL CREEP STRAIN CURVES FOR EXTRUSIONS IN F CONDITION. (9)

3	Mg
3	Al
1	Zn

AZ31B

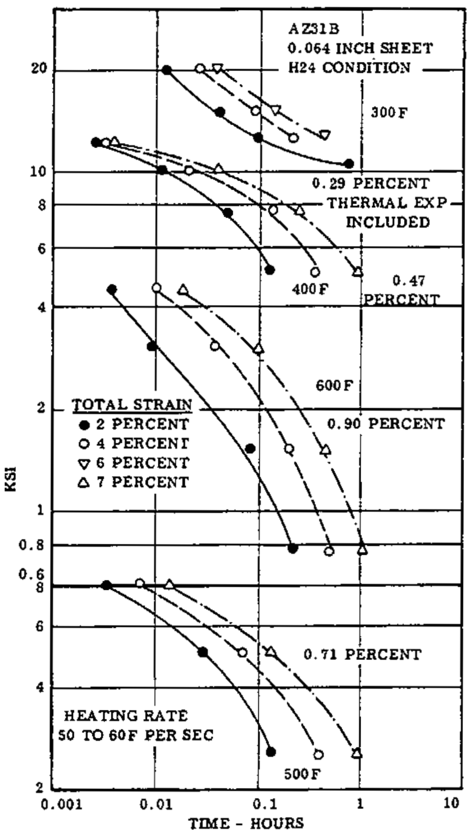

FIG. 3.044 SHORT TIME TOTAL STRAIN CURVES AT 300 TO 600F FOR SHEET IN H24 CONDITION. (31)

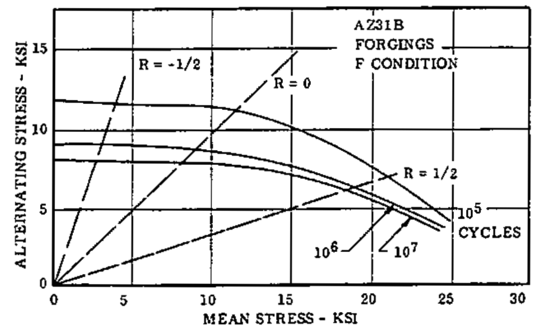

FIG. 3.053 STRESS RANGE DIAGRAM FOR FORGINGS AT 90 PERCENT SURVIVAL LEVEL. (33)

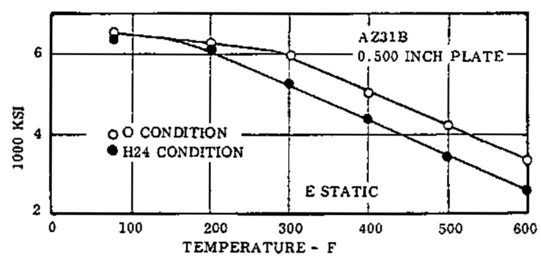

FIG. 3.062 MODULUS OF ELASTICITY. (35)

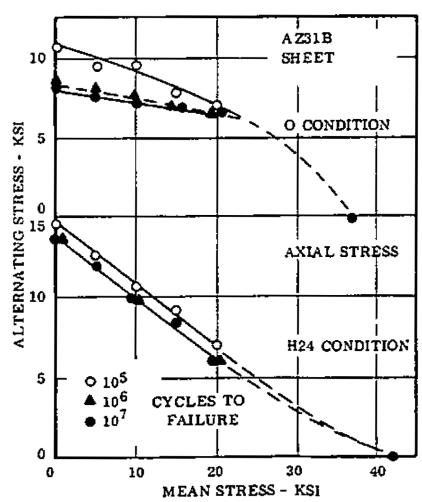

FIG. 3.052 STRESS RANGE DIAGRAMS FOR SHEET IN THE O AND H24 CONDITIONS. (34)

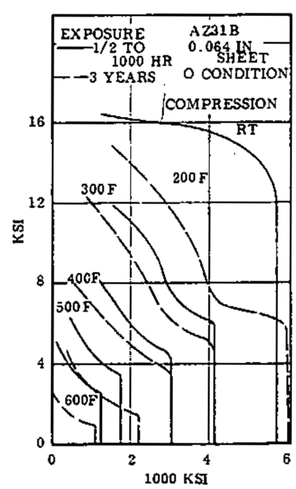

FIG. 3.064 TANGENT MODULUS CURVES IN COMPRESSION FOR SHEET IN O CONDITION. (23)(24)

	Mg
3	Al
1	Zn

AZ31B

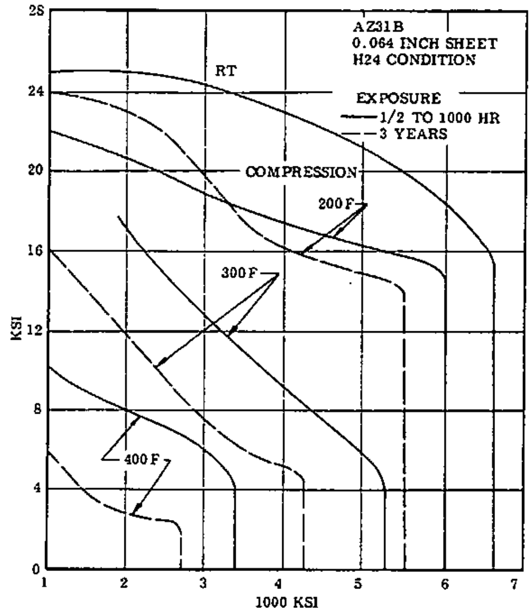

FIG. 3.065 TANGENT MODULUS CURVES IN COMPRESSION FOR SHEET IN H24 CONDITION. (24)(30)(36)

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