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Volume 2, Chapters 5 and 6

DAMAGE TOLERANT DESIGN HANDBOOK

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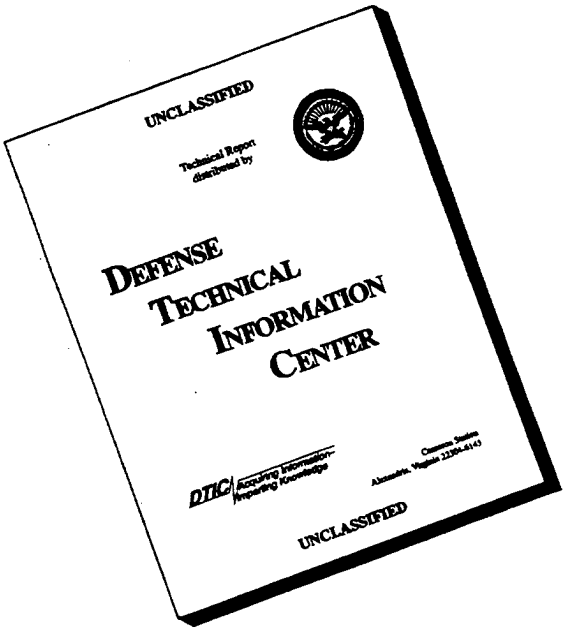

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This report presents a compilation of mechanical property data that are useful for damage tolerant design and analyses. The data of this handbook combines the old data that were previously presented in MCIC-HB-OIR (Damage Tolerant Design Handbook, December 1983) and more recent data that were collected from various sources. The fracture toughness, crack growth, R-curve, sustained load and threshold data are for alloy and stainless steels, nickel based super alloys, titanium alloys and aluminum alloys.

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Table of Contents

VOLUME 1

VOLUME 2

VOLUME 3

VOLUME 4

VOLUME 5

Foreword

This report summarizes the results of a damage tolerant, material property data collection and reporting program conducted under USAF Contract F33615-91-C-5610. The work was sponsored by the Materials Directorate of Wright Laboratory with Mr. Jack Coate of the Systems Support Division serving as the project monitor. The technical effort was conducted between June 1991 and January 1994. The work was performed by the University of Dayton Research Institute under the general supervision of Dr. Joseph P. Gallagher with Dr. Alan P. Berens serving as Principal Investigator.

This final report comprises eight chapters which are presented in five volumes as follows:

VOLUME	CHAPTER	DESCRIPTION
1	1	Handbook organization and content
	2	Methods of calculation
	3	Alloy Steels
	4	Stainless Steels
2	5	Nickel Based Super Alloys
	6	Titanium Alloys
3	7	Aluminum 2000/6000 Series Alloys
4 & 5	8	Aluminum 7000/8000 Series Alloys

A detailed listing of the materials represented in the Handbook is contained in the preceding Table of Contents. In the body of the Handbook, the pages are numbered within chapters and the relevant portion of the table of contents is repeated at the beginning of each chapter.

CHAPTER 5
NICKEL BASED SUPER ALLOYS SECTIONS

TABLE 5.0.1

AVAILABLE DATA FOR NICKEL ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
ASTROLOY 901	Unspecified	Unspecified				15		
ASTROLOY P/M-H	2025F 3HR AC 1600F 8HR AC	Disk				8		
ASTROLOY P/M-W	2025F 4HRS AC 1600F 8HRS AC	Disk				8		
IN100	Unspecified	Unspecified				16		
		Forging				32		
	PRESTRAIN	Forging				1		
IN100 P/M-G	2050F 2HRS OQ 1600F 0.67HR AC	Disk				6		
INCOLOY 901	Unspecified	Unspecified				1		
INCONEL 600	1585F .75HR AC	Plate				19		
INCONEL 625	MA	Plate				11		
INCONEL 718	Unspecified	Unspecified				4		
	1325F 8 HR FC TO 1150F HOLD 18 HR	Forging	1					
	1325F 8HRS FC TO 1150F	Forging				3		
	1325F 9 HR FC TO 1150F AT 100F/HR HOLD AT 1150F 8 HR AC	Forging	2					
	1750F 1HR AC 1325F	Plate				2		
		Forged Bar				5		
	1750F AC	Sheet				1		
	1750F AC 1325F	Sheet				3		
		Plate				23		
		Forging				5		
		Forged Bar				5		

TABLE 5.0.1 (CONTINUED)

AVAILABLE DATA FOR NICKEL ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
INCONEL 718 (Con't)	1750F 1HR Q 1 325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR	Disk				15		
	1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR	Disk				30		
	1760F 1HR WQ 1325F 8HRS	Disk				5		
	1800F 1HR Q 1325F 8HRS FC TO 1150F HOLD 8HRS AC	Forging				4		
	1850F 1.5HR OQ 1360F 9HRS FC TO 1175F	Forged Bar						8
	1880F 1HR AC 1520F 8HR FC 1200F 16HR AC	Sheet						5
	1950F AC 1325F	Plate				4		
	ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HOUR TO 1150F, 1150F 8HR, AC	Plate				13		
	COLD ROLLED 30PERCENT AND AGED	Sheet		59				
	ST 1850F 1360 F 9HRS F/C 1175F	Forged Bar				11		
	ST-CW-A	Round Bar	3					
	STA	Forging	7			20		
		Round Bar	4					
NASA IIB-7 P/M	1650F 16HRS TO 2000F 1HR OQ	Disk				7		
P/M RENE 95	2080F 1HR AC 1600F 1HR AC	Disk				8		
	2100F 1HR SQ AT 1000F	Disk				4		
RENE 95 (H&F)	2000F 1HR SQ AT 1000F	Forging				4		
WASPALOY	Unspecified	Unspecified				2		
		Forging				36		

TABLE 5.0.1 (CONCLUDED)

AVAILABLE DATA FOR NICKEL ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
WASPALOY (Con't)	1850F 2HRS 1350F 6HRS	Billet				1		
	1850F 2HRS 1600F 24HRS (FINE GS	Billet				1		
	1875F 4HRS OQ 1550F 4HRS AC	Disk				9		
	2010F 2HRS 1350F 6HRS	Billet				1		
	2010F 2HRS 1600F 24HRS	Billet				1		

TABLE 5.0.2

PLANE STRAIN FRACTURE TOUGHNESS VALUES OF NICKEL BASE SUPER ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Range of Product Thickness (in.)	K_{Ic} ($Ksi\sqrt{in}$)											
				Specimen Orientation											
				L-T				T-L				S-L			
				Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev
INCONEL 718	STA	Forging	3.00-3.30	1.50	2	118.5	0.7	1.50	2	107.9	14.0	---	---	---	---

TABLE 5.0.3.1

PLANE STRESS AND TRANSITIONAL FRACTURE TOUGHNESS OF NICKEL BASE SUPER ALLOYS (WITHOUT BUCKLING CONSTRAINTS)

Alloy	Condition/ Heat Treatment	Test Temp (°F)	Specimen		Yield Strength (Ksi)	K_c ($Ksi\sqrt{in}$) Specimen Thickness (in.) n - Sample size μ - Mean σ - Standard Deviation											
			Orient	Width (in.)		0.027											
						n	μ	σ	n	μ	σ	n	μ	σ	n	μ	σ
INCONEL 718	COLD ROLLED 30% AND AGED	-423.	L-T	4.0	269.0	15	191.1	7.5									
		-320.	L-T	4.0	259.0	13	200.5	13.8									
		R.T.	L-T	4.0	218.0	6	178.5	3.5									
				18.0	218.0	5	224.6	11.0									

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR NICKEL BASED ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: Unspecified **STRESS RATIO: 0.05 - 0.1** **FREQUENCY: 0.17 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
ASTROLOY 901	99	UNSPECIFIED	0.1	0.17				1.11	18.31	
INCONEL 625	MA	PLATE	0.05	10				2.07		
INCONEL 718	1750F 1HR AC 1325F	PLATE	0.05	10				1.65		
	1750F AC 1325F	SHEET	0.05	5				1.95		
		FORGING	0.05	10				1.93	40.69	
WASPALOY	1850F 2HRS 1350F 6HRS	BILLET	0.1	10					10.46	
	2010F 2HRS 1350F 6HRS	BILLET	0.1	10					2.8	
	2010F 2HRS 1600F 24HRS	BILLET	0.1	10					9.56	

TABLE 5.0.4.2

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR NICKEL BASED ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: L-T **STRESS RATIO: -0.2 - 0.8** **FREQUENCY: 4. - 30. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
INCONEL 718	1750F AC 1325F	PLATE	0.05	8.33				1.28	30.57	
	1950F AC 1325F	PLATE	0.05	8.33				1.05		
	ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HOUR TO 1150F, 1150F 8HR, AC	PLATE	-0.2	10				1.14		
			0.02	4				0.92	16.4	
			0.02	20				1.75		
			0.5	10				2.97		
	STA	FORGING	0.1	15-20				2.45	57.53	
			0.4	20				3.42		
			0.8	20-30			0.47			
	UNSPECIFIED	UNSPECIFIED	0.1	10			0.13	2.46	56.78	

TABLE 5.0.4.3

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR NICKEL BASED ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: T-L **STRESS RATIO: -1. - 0.8** **FREQUENCY: 5. - 30. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
INCONEL 718	1750F 1HR AC 1325F	FORGED BAR	0.05	8.33-10				3.08	116.49	
	STA	FORGING	-1	5				0.69	29.84	
			0.1	15-20				2.19	83.07	
			0.4	20				3.16		
			0.8	20-30			0.47			

TABLE 5.0.4.4

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR NICKEL BASED ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: C-R **STRESS RATIO: 0.0 - 0.05** **FREQUENCY: 0.33 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
					ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
INCONEL 718	1750F AC 1325F	FORGED BAR	0.05	10				2.56	43.72	
	1760F 1HR WQ 1325F 8HRS	DISK	0.	0.33				3.39		
P/M RENE 95	2080F 1HR AC 1600F 1HR AC	DISK	0.	0.33				0.4	31.02	

TABLE 5.0.5

STRESS CORROSION CRACKING THESHOLD DATA FOR NICKEL BASE ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Specimen Orientation	K_{Iscc} $Ksi\sqrt{in}$				
				Environment				
				Shop Cleaning Solvent	Sump Tank Water	Martin-Marietta Refined Grade Hydrazine	Matheson-Coleman-Bell 97% Grade Hydrazine	Propellant Grade Hydrazine
INCONEL 718	1850F 1.5HR OQ 1360F 9HRS FC TO 1175F	Forged Bar	L-T	126(2)	133(2)			
			T-L		105(2)			
			S-L		93(2)			
	1880F 1HR AC 1520F 8HR FC 1200F 16HR AC	Sheet	---			79(2)	25.8	87.5

TABLE 5.1.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK ASTROLOY 901 AT ROOM TEMPERATURE

ORIENTATION: Unspecified **ENVIRONMENT: Lab Air**

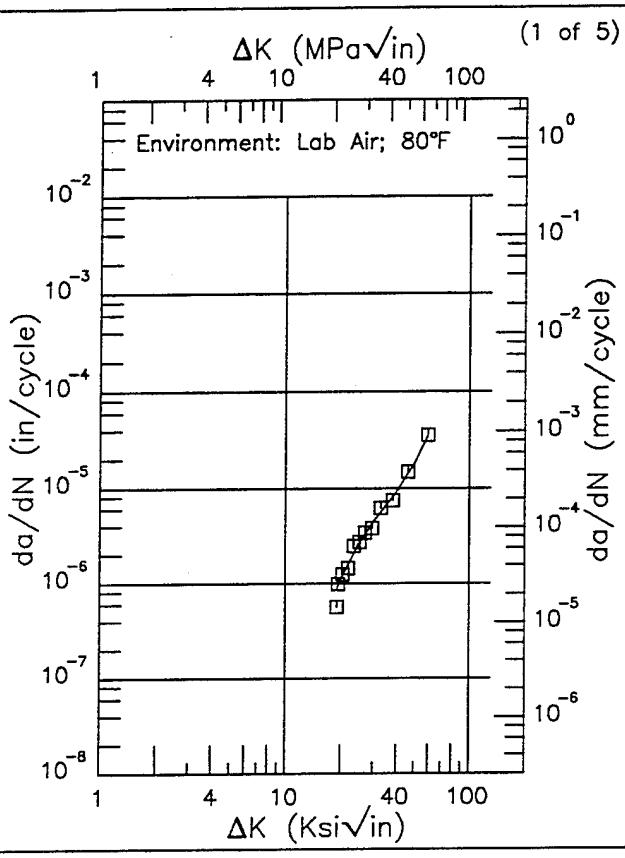
CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	UNSPECIFIED	0.1	0.17				1.11	18.31	

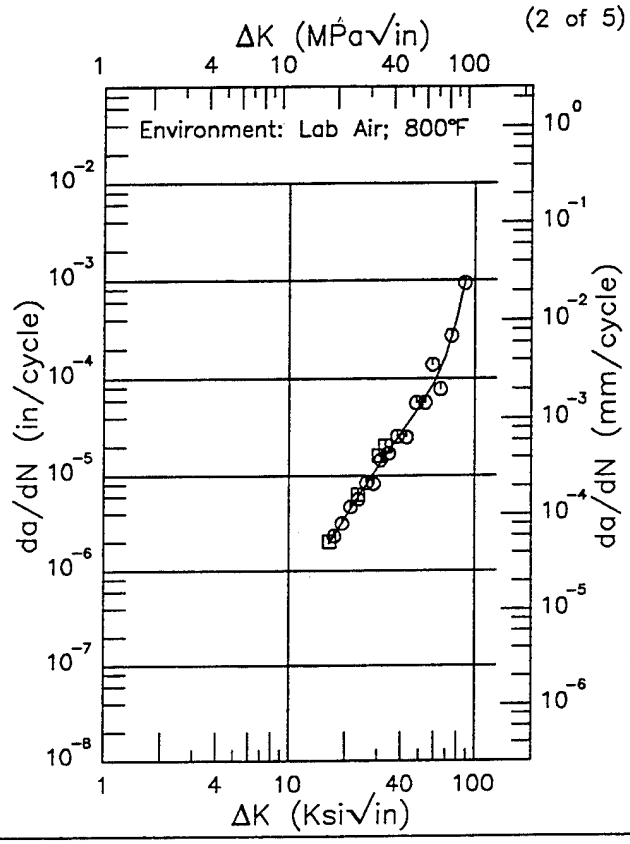
ASTROLOY 901

EF

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 0.121 – 0.126 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.88 (min)	0.841
20.	1.11
25.	2.62
30.	4.44
35.	6.59
40.	9.30
50.	18.3
59.15 (max)	35.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.50 (min)	1.94
20.	3.60
25.	7.09
30.	12.1
35.	18.8
40.	27.4
50.	51.3
60.	88.1
70.	167.
80.	393.
88.23 (max)	948.

RMS % Error	Life Prediction Ratio Summary
12.50	0. .5 .8 1.25 2.

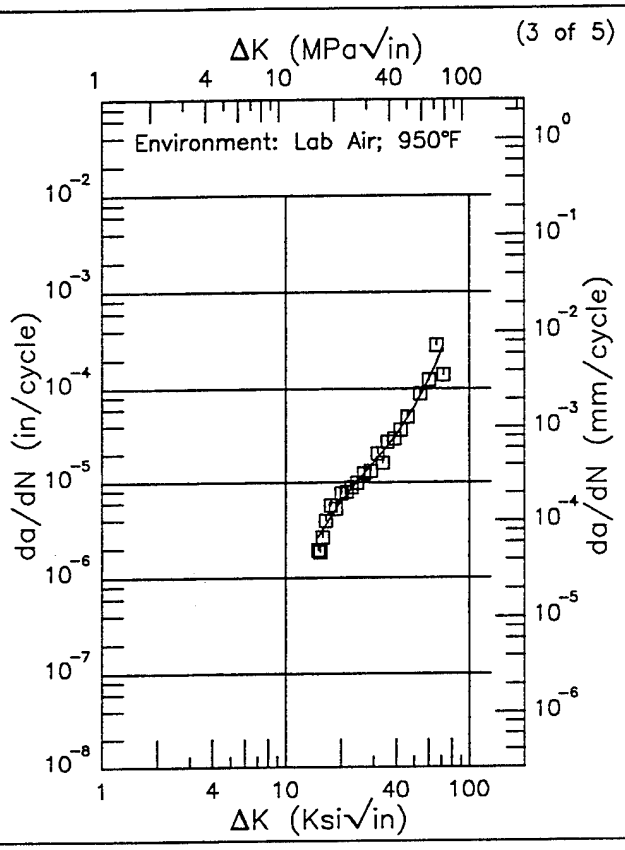
RMS % Error	Life Prediction Ratio Summary
21.01	0. .5 .8 1.25 2.

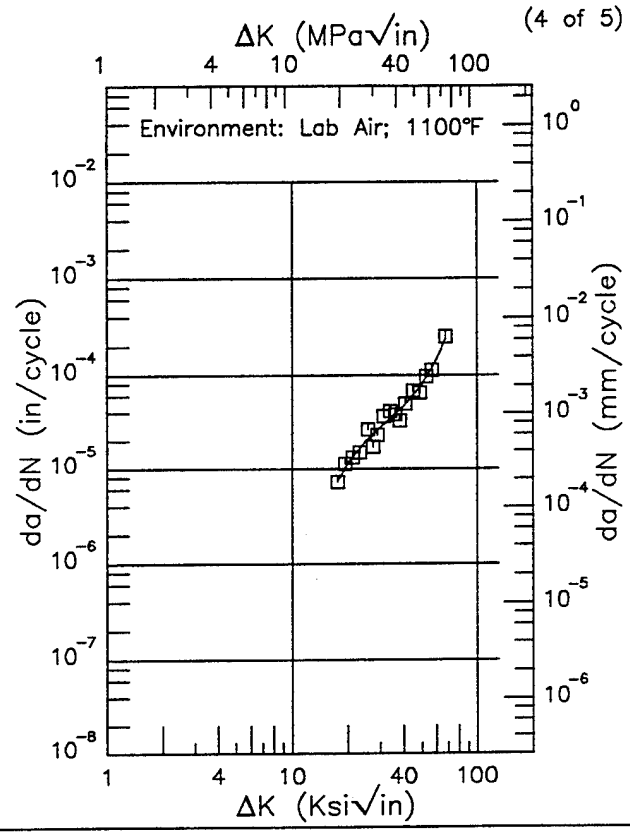
Figure 5.1.3.1.1

ASTROLOY 901 EF

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 0.121 – 0.126 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.98 (min)	2.63
16.	3.28
20.	6.29
25.	10.8
30.	16.4
35.	23.4
40.	32.8
50.	63.5
60.	124.
70.	249.
71.72 (max)	281.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.59 (min)	7.56
20.	11.5
25.	19.7
30.	27.6
35.	36.2
40.	46.5
50.	79.0
60.	145.
67.44 (max)	241.

RMS % Error	Life Prediction Ratio Summary
20.98	0. .5 .8 1.25 2.

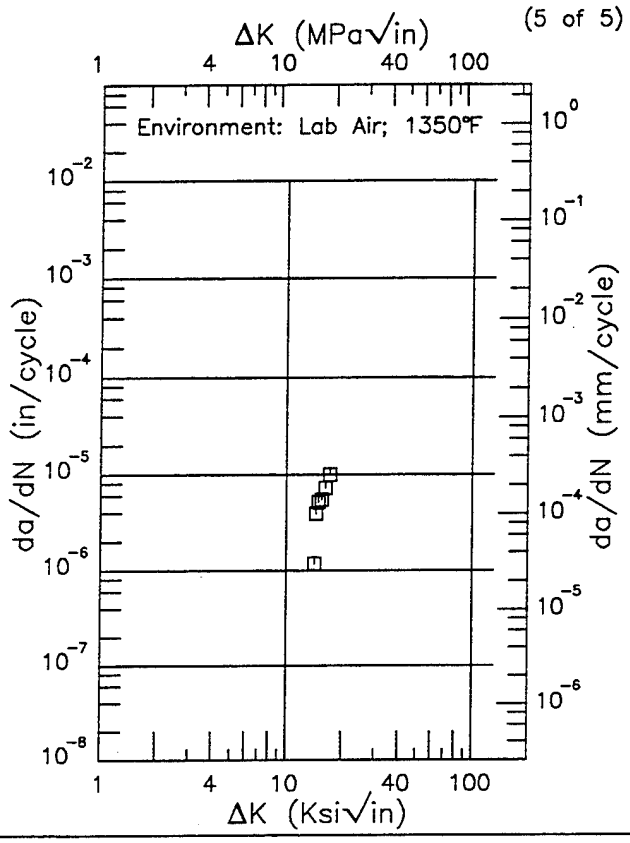
RMS % Error	Life Prediction Ratio Summary
14.54	0. .5 .8 1.25 2.

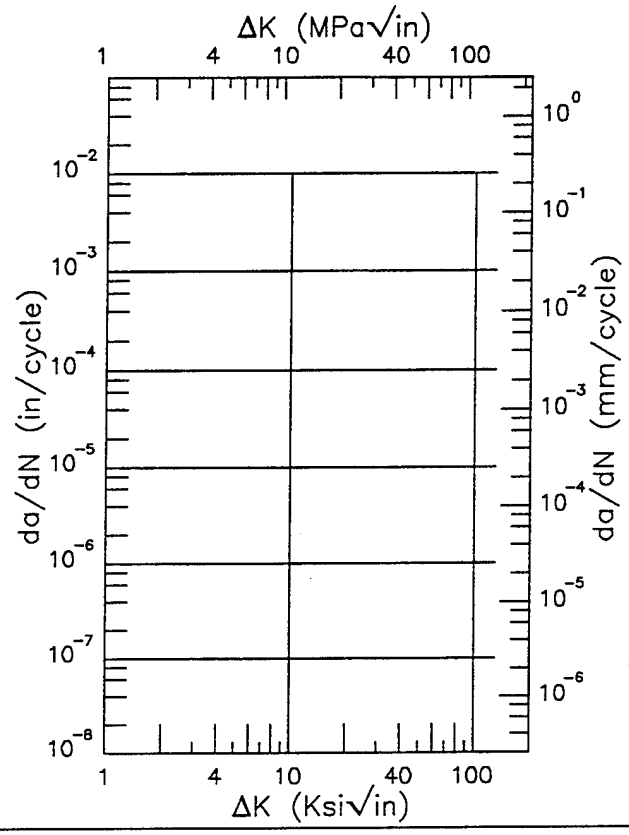
Figure 5.1.3.1.1 (Continued)

EF ASTROLOY 901

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 0.121 – 0.126 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

Figure 5.1.3.1.1 (Concluded)

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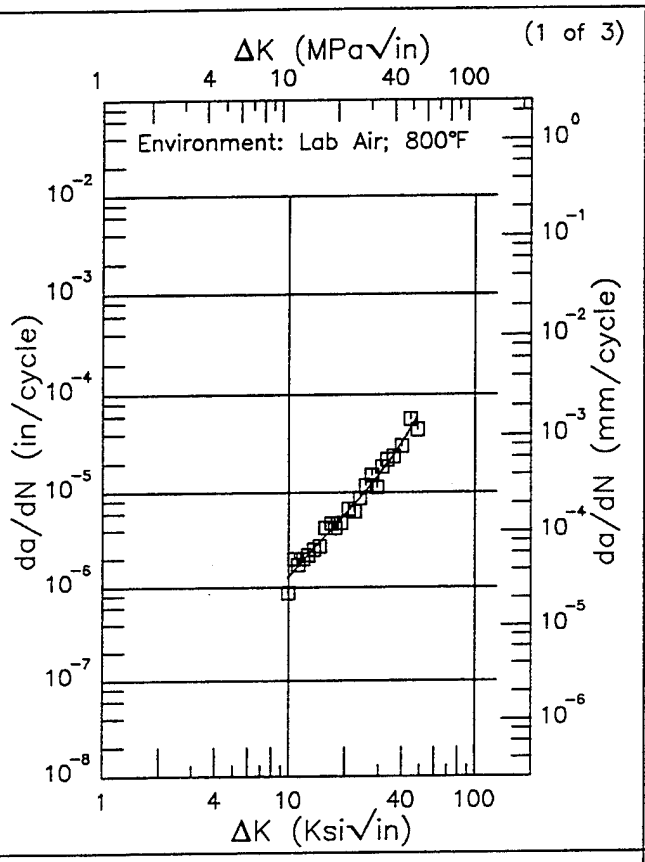
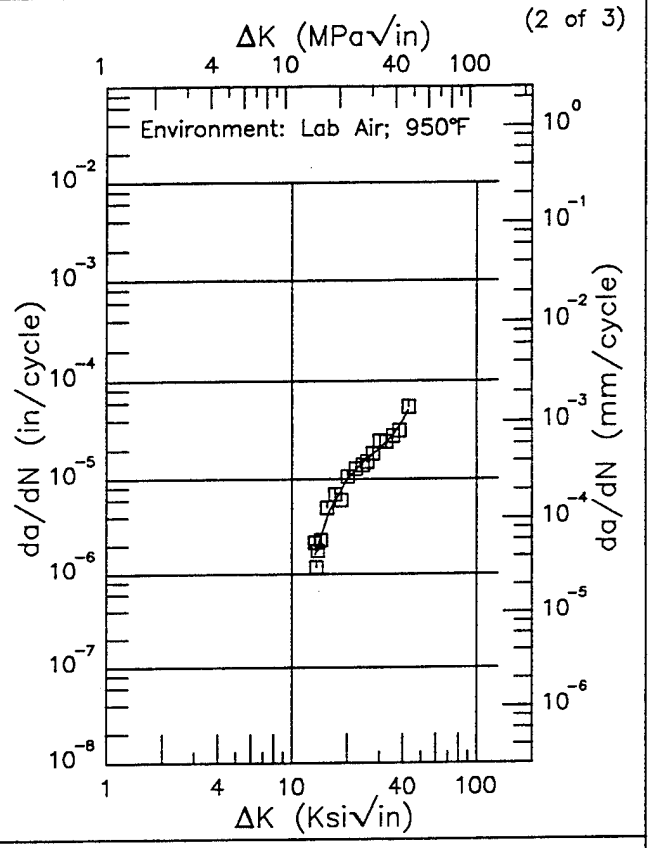
ASTROLOY 901

EF

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.5

Yield Strength:
Ult. Strength:
Specimen Thk: 0.12 – 0.124 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.87 (min)	1.27
10.	1.31
13.	2.34
16.	3.65
20.	5.91
25.	9.79
30.	15.2
35.	22.7
40.	32.9
48.57 (max)	59.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.38 (min)	1.60
16.	4.57
20.	10.0
25.	15.6
30.	20.7
35.	27.7
40.	39.7
42.89 (max)	50.9

RMS % Error	Life Prediction Ratio Summary
15.77	0. .5 .8 1.25 2.

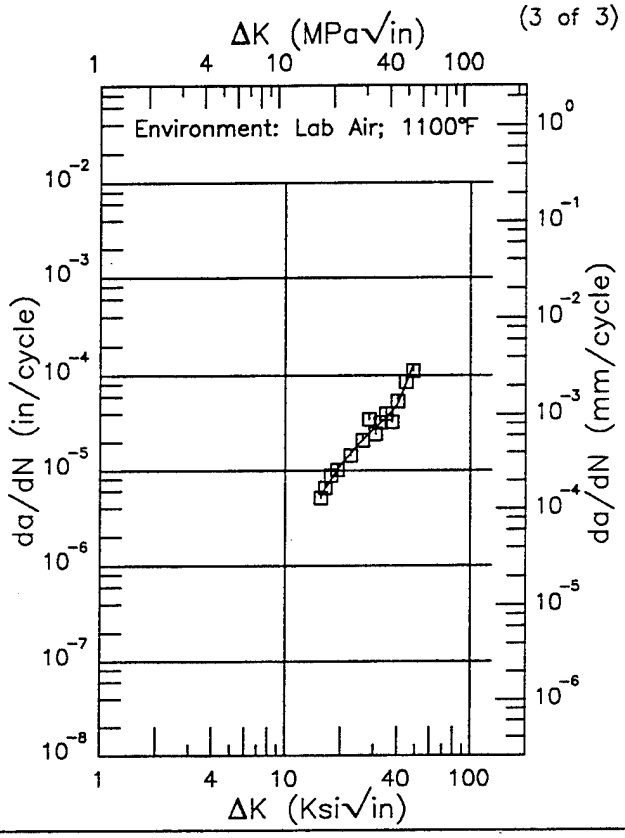
RMS % Error	Life Prediction Ratio Summary
16.54	0. .5 .8 1.25 2.

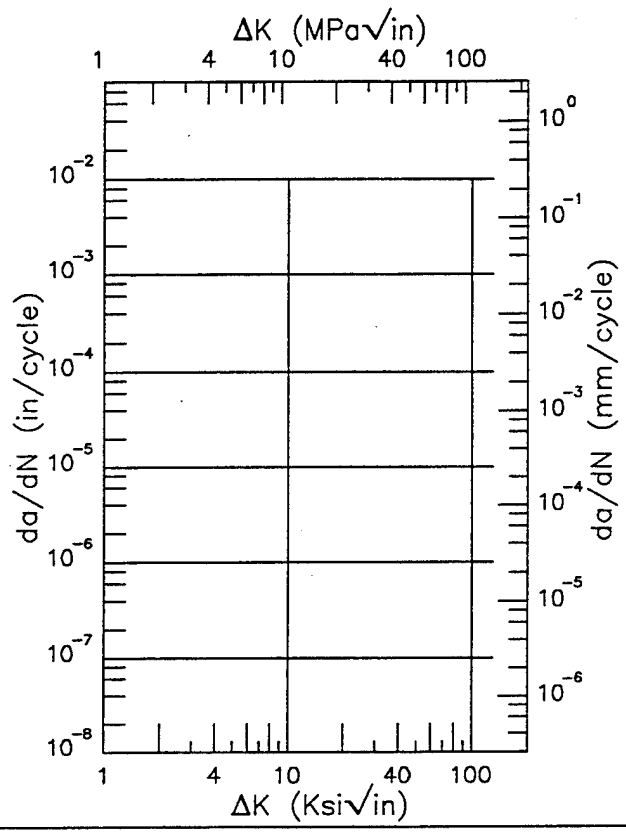
Figure 5.1.3.1.2

ASTROLOY 901 EF

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.5

Yield Strength:
Ult. Strength:
Specimen Thk: 0.12 – 0.124 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.58 (min)	5.41
16.	5.92
20.	11.5
25.	19.4
30.	27.7
35.	36.3
40.	49.6
48.57 (max)	124.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
13.77	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

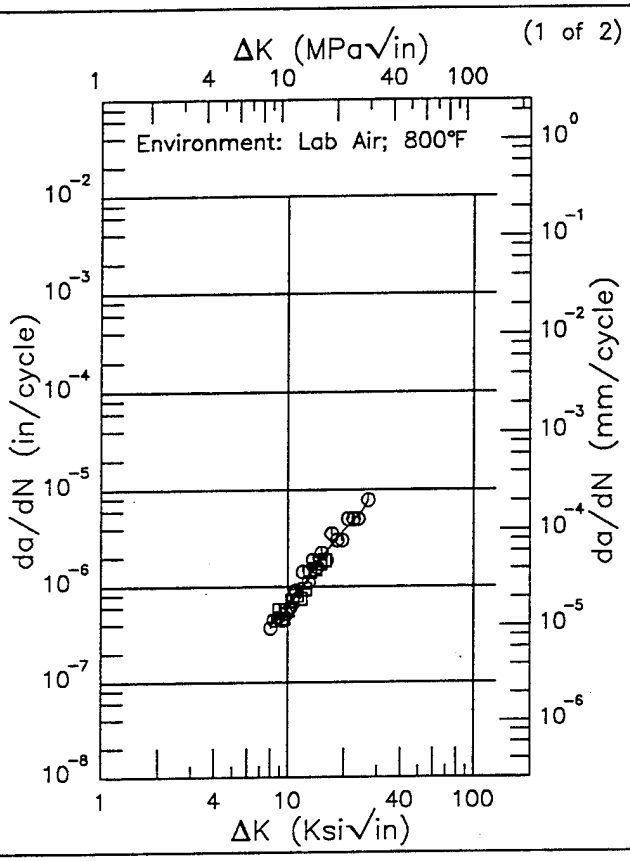
Figure 5.1.3.1.2 (Concluded)

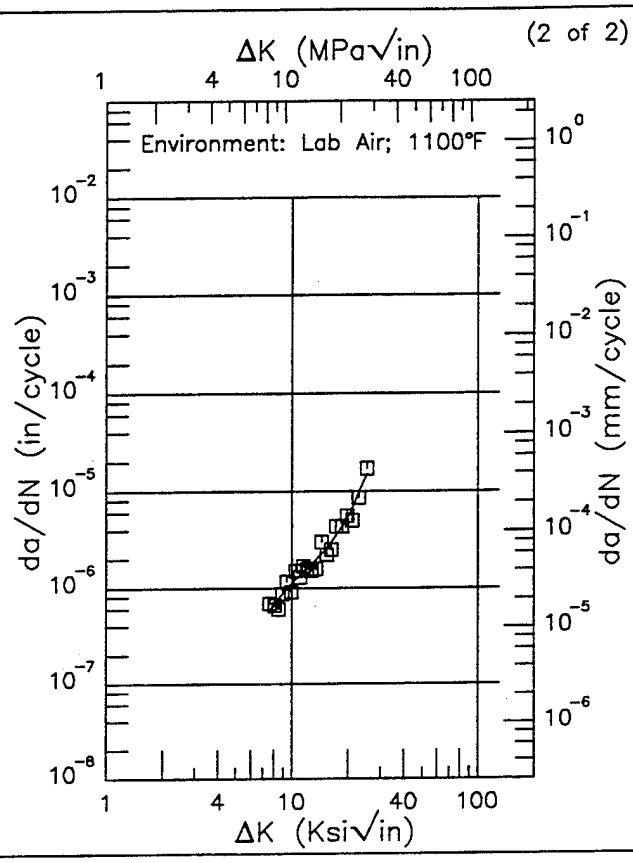
EF

ASTROLOY 901

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.7

Yield Strength:
Ult. Strength:
Specimen Thk: 0.119 – 0.123 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.01 (min)	0.399
9.	0.472
10.	0.594
13.	1.26
16.	2.30
20.	3.86
25.	6.11
26.83 (max)	7.65

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.57 (min)	0.560
8.	0.661
9.	0.894
10.	1.12
13.	1.82
16.	2.78
20.	5.32
25.	14.3
25.23 (max)	15.0

RMS % Error	Life Prediction Ratio Summary
14.87	0. .5 .8 1.25 2.

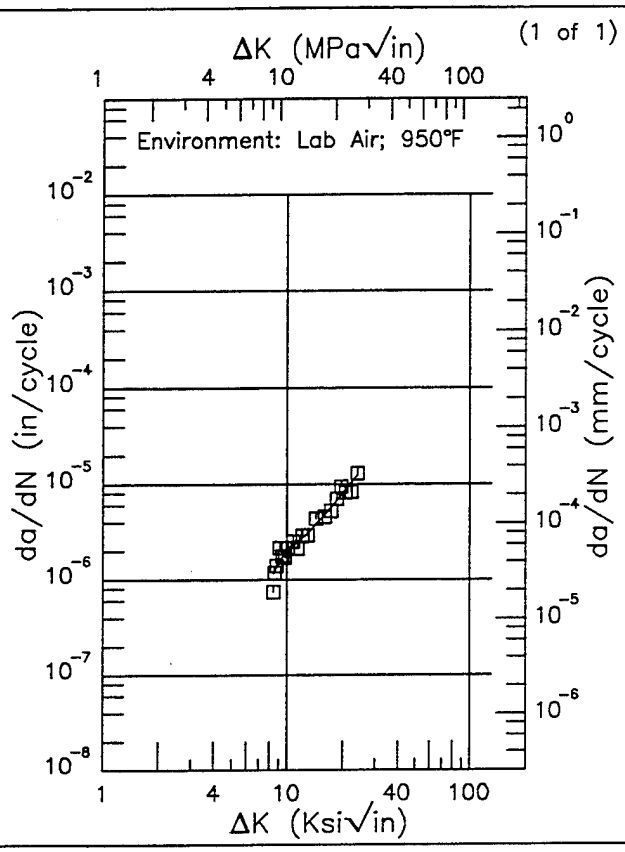
RMS % Error	Life Prediction Ratio Summary
16.94	0. .5 .8 1.25 2.

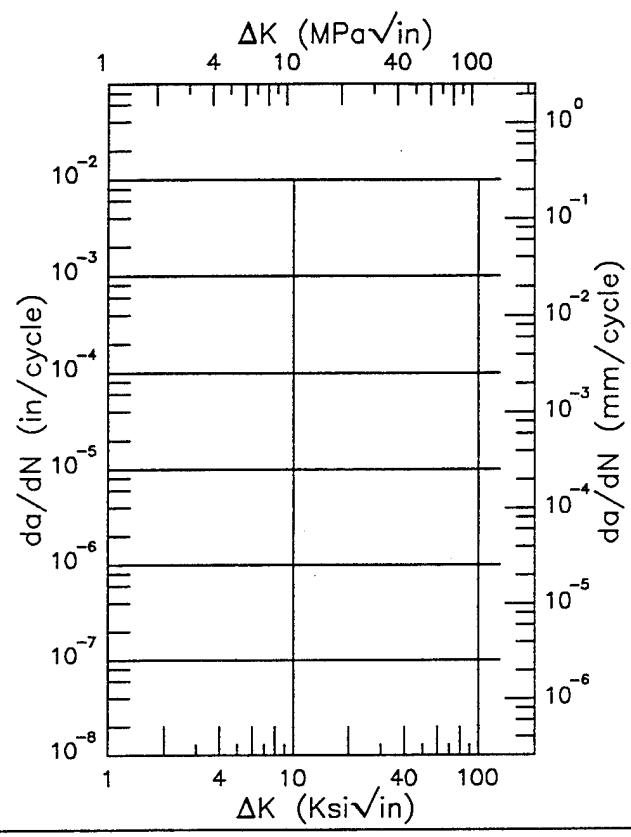
Figure 5.1.3.1.3

ASTROLOY 901 EF

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Stress Ratio: 0.8

Yield Strength:
Ult. Strength:
Specimen Thk: 0.117 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.44 (min)	1.16
9.	1.52
10.	2.05
13.	3.08
16.	4.86
20.	8.10
24.05 (max)	12.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
15.00	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

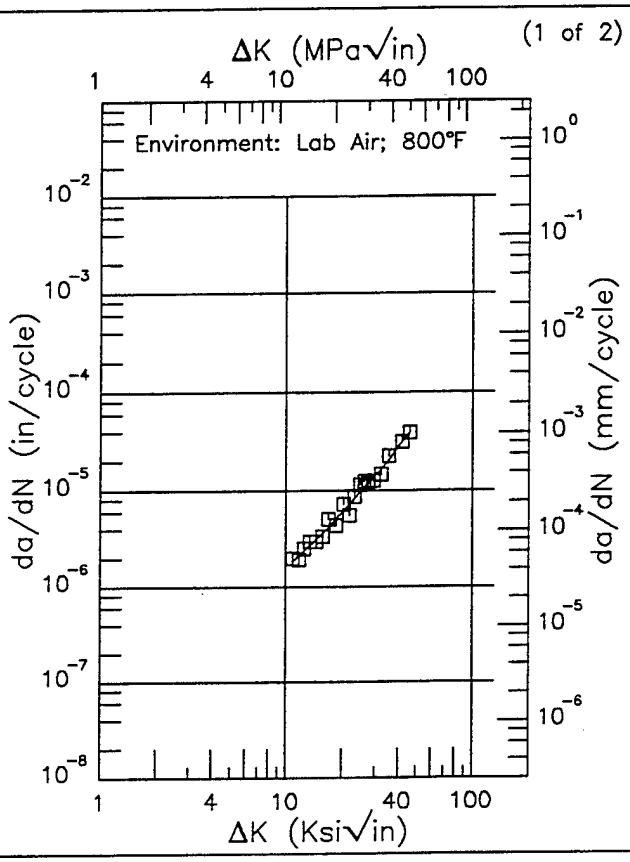
Figure 5.1.3.1.4

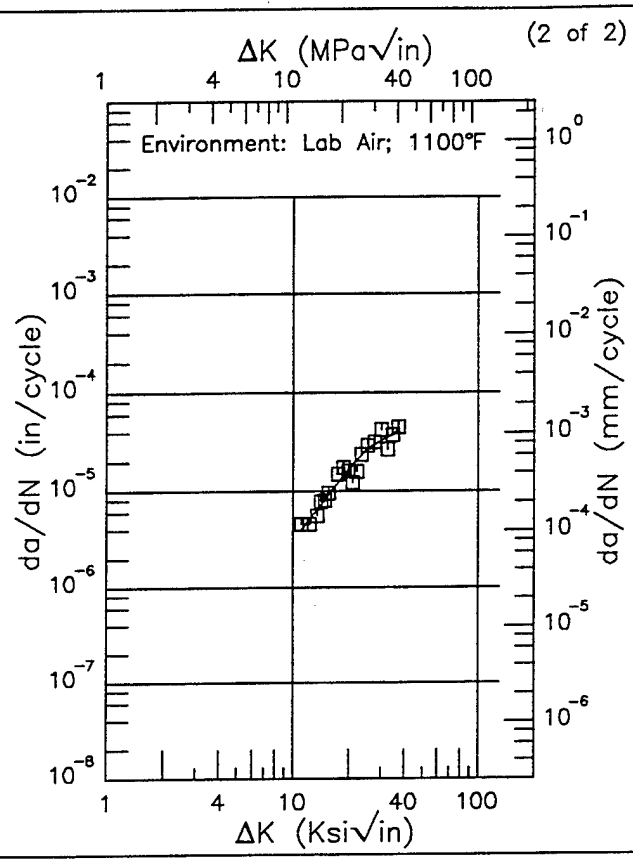
EF

ASTROLOY 901

Condition/Ht:
Form:
Specimen Type: SENT
Orientation: C–R
Stress Ratio: 0.5

Yield Strength:
Ult. Strength:
Specimen Thk: 0.122 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.86 (min)	1.84
13.	2.55
16.	3.77
20.	5.94
25.	9.75
30.	14.3
35.	19.8
40.	28.5
45.80 (max)	38.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.04 (min)	3.90
13.	5.89
16.	9.84
20.	16.7
25.	26.5
30.	32.7
35.	37.9
36.86 (max)	42.0

RMS % Error	Life Prediction Ratio Summary
11.88	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.45	0. .5 .8 1.25 2.

Figure 5.1.3.1.5

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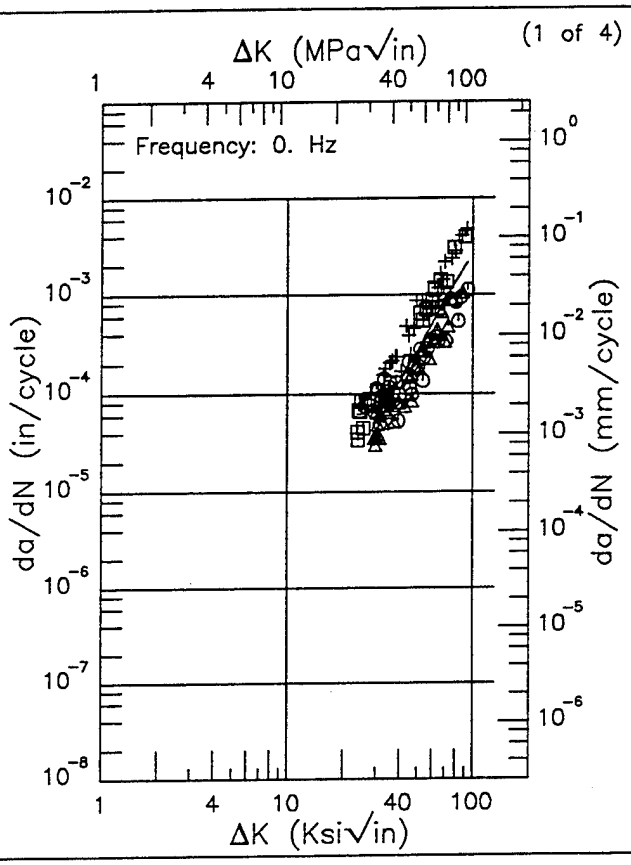
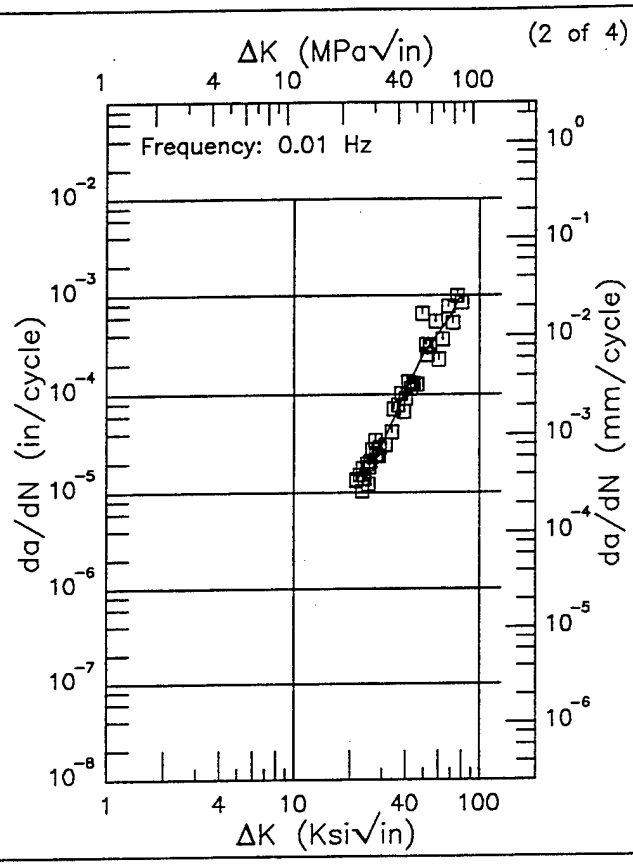
ASTROLOY P/M-H

F

Condition/Ht: 2025F 3HR AC 1600F 8HR AC
Form: Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 135.8 ksi
Ult. Strength: 202 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.79 (min)	61.8
25.	61.8
30.	71.6
35.	94.6
40.	132.
50.	262.
60.	492.
70.	845.
80.	1326.
90.	1913.
93.51 (max)	2136.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.63 (min)	14.1
25.	17.2
30.	30.7
35.	59.1
40.	108.
50.	258.
60.	411.
70.	607.
80.	1019.
80.05 (max)	1022.

RMS % Error	Life Prediction Ratio Summary
66.39	0. .5 .8 1.25 2.

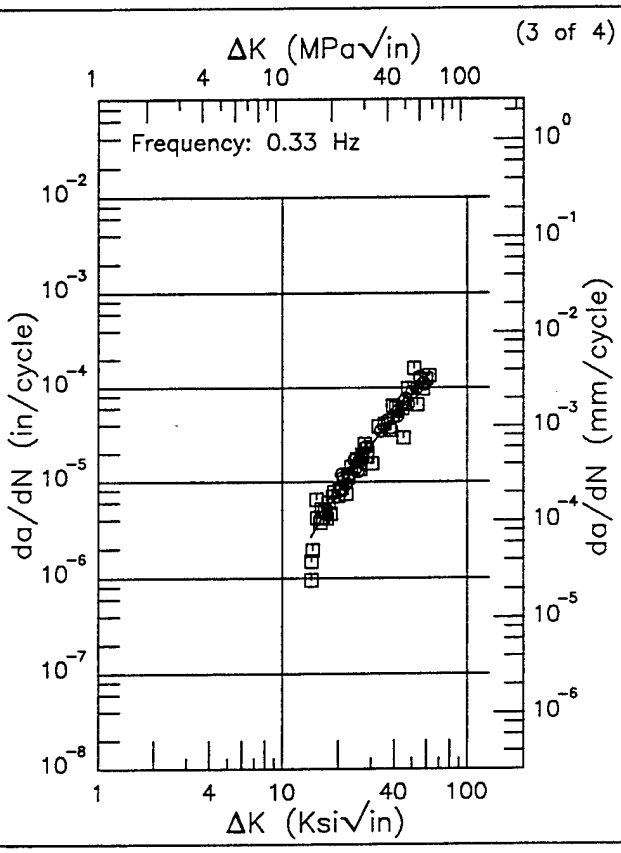
RMS % Error	Life Prediction Ratio Summary
35.81	0. .5 .8 1.25 2.

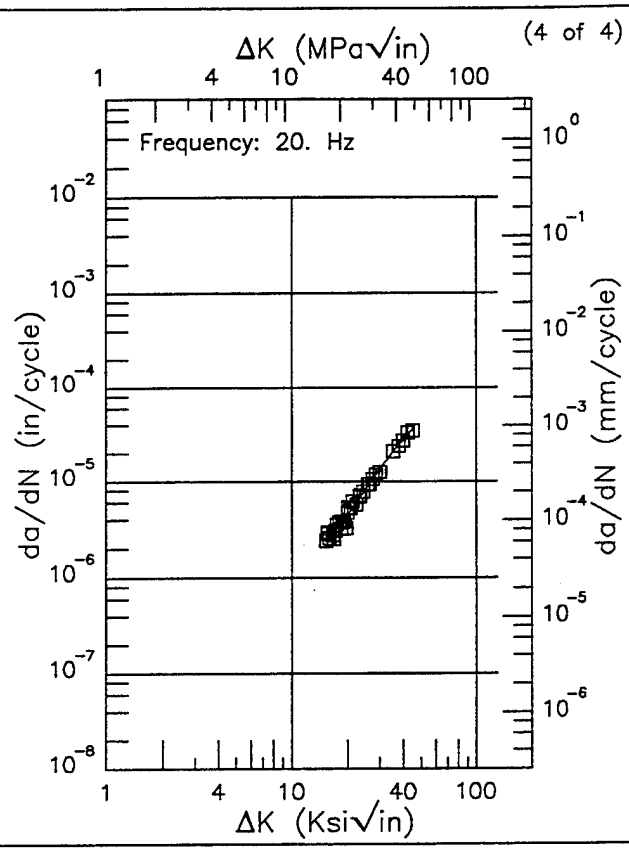
Figure 5.2.3.1

ASTROLOY P/M-H F

Condition/Ht: 2025F 3HR AC 1600F 8HR AC
Form: Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 135.8 ksi
Ult. Strength: 202 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.25 (min)	2.67
16.	3.95
20.	7.93
25.	14.9
30.	24.2
35.	35.7
40.	49.4
50.	84.4
60.	130.
62.12 (max)	142.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.27 (min)	2.38
16.	2.63
20.	4.53
25.	8.25
30.	13.5
35.	20.2
40.	27.9
44.64 (max)	35.4

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
25.09	0. .5 .8 1.25 2.	8.69	0. .5 .8 1.25 2.

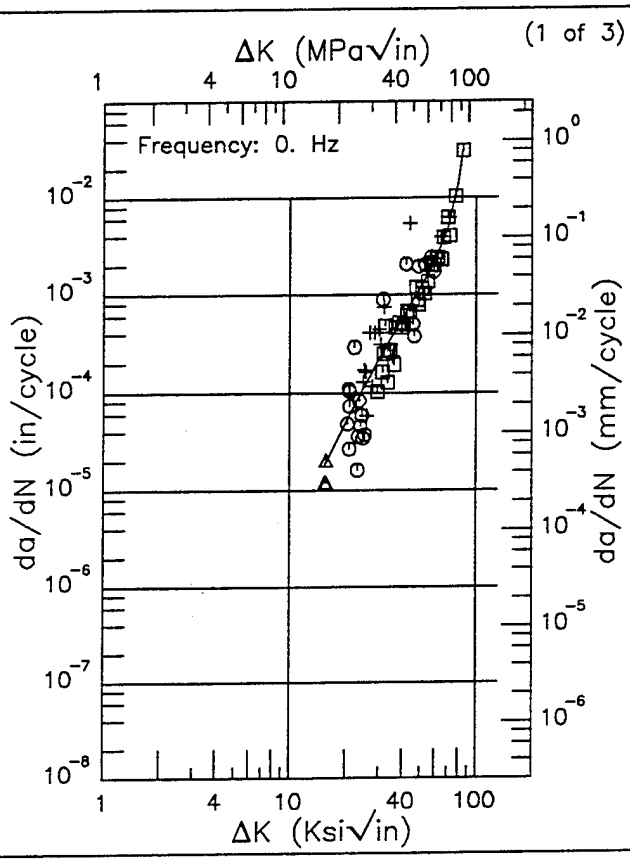
Figure 5.2.3.1 (Concluded)

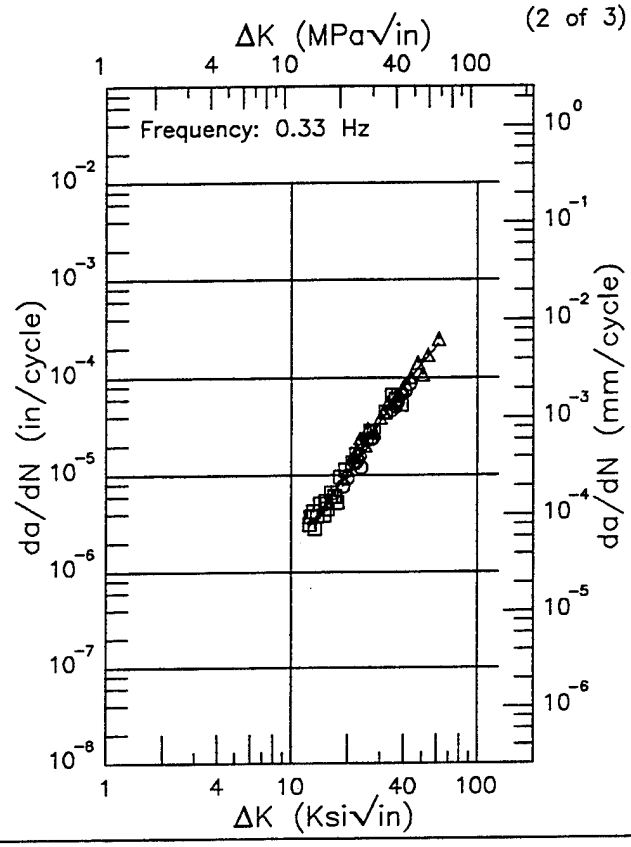
ASTROLOY P/M-W

F

Condition/Ht: 2025F 4HRS AC 1600F 8HRS AC
Form: Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 153 ksi
Ult. Strength: 220 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.46 (min)	18.4
16.	21.0
20.	49.5
25.	114.
30.	220.
35.	371.
40.	571.
50.	1162.
60.	2199.
70.	4749.
80.	14463.
84.92 (max)	30958.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.48 (min)	2.98
13.	3.29
16.	5.65
20.	10.6
25.	20.6
30.	35.2
35.	54.9
40.	79.4
50.	140.
60.	208.
61.82 (max)	221.

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.04	0. .5 .8 1.25 2.

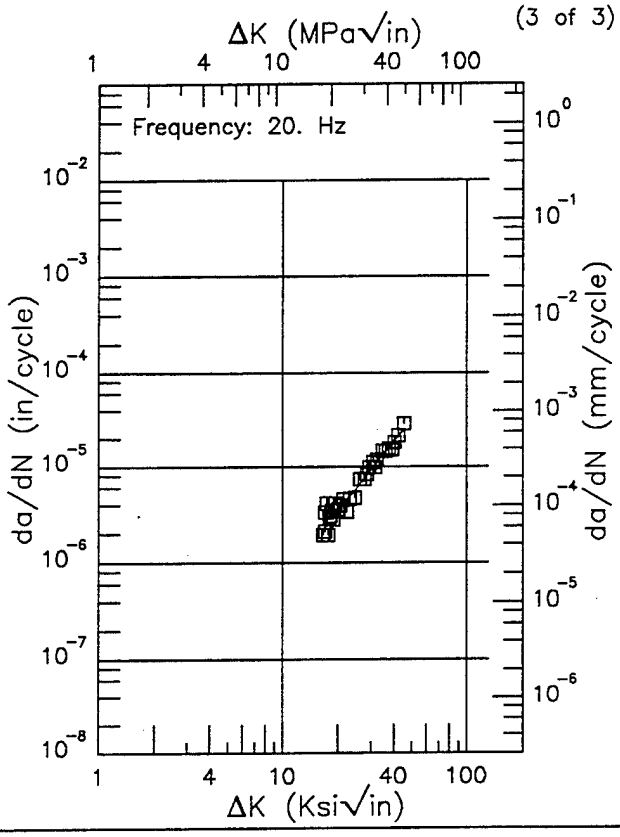
Figure 5.3.3.1

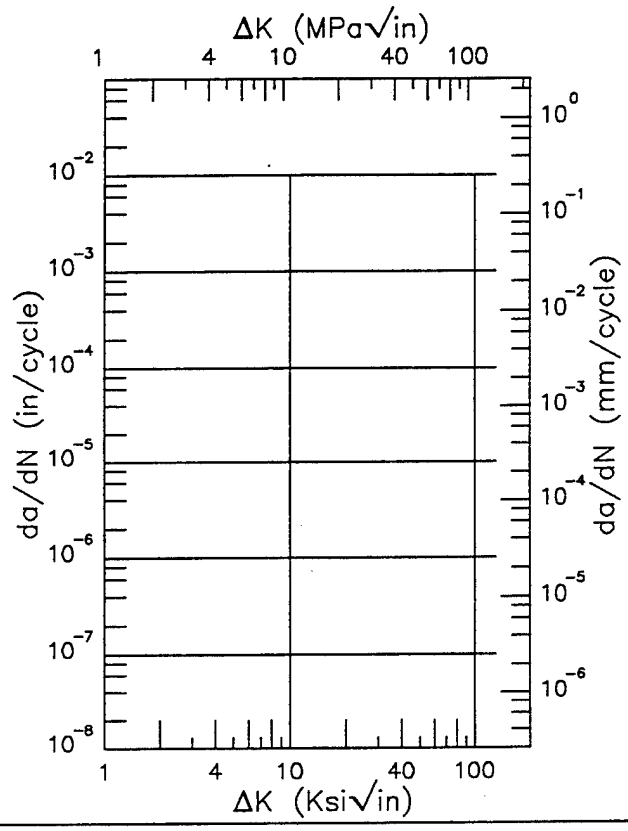
ASTROLOY P/M-W F

Condition/Ht: 2025F 4HRS AC 1600F 8HRS AC
Form: Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 153 ksi
Ult. Strength: 220 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.61 (min)	2.54
20.	3.51
25.	5.80
30.	9.19
35.	13.6
40.	18.9
45.34 (max)	25.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 16.00

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

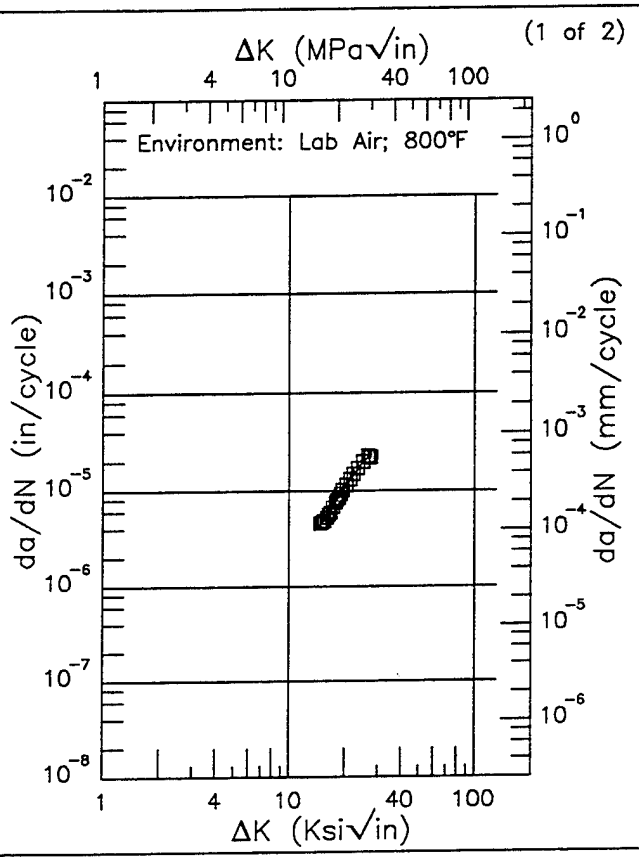
Figure 5.3.3.1 (Concluded)

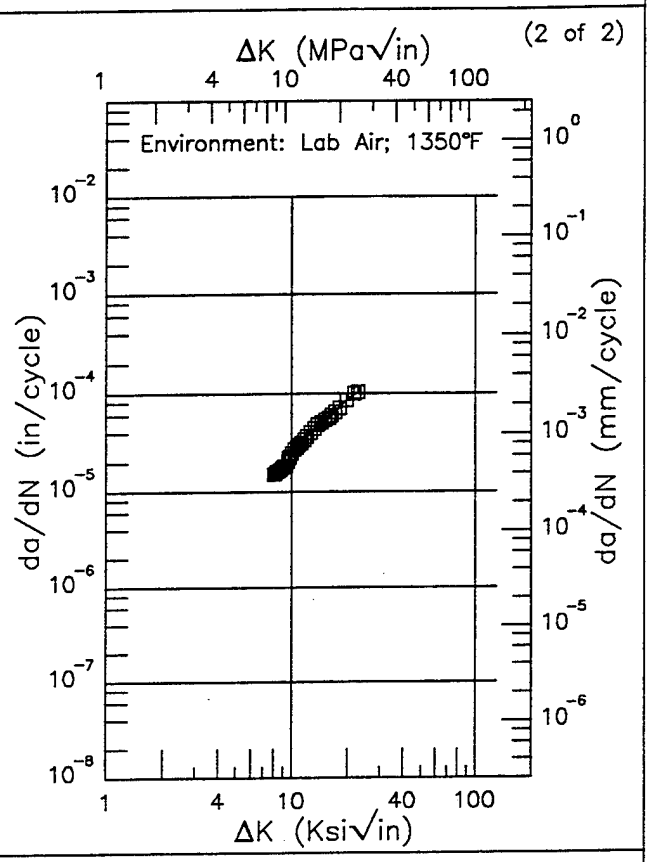
IN100

E

Condition/Ht:
Form:
Specimen Type: CT
Orientation:
Stress Ratio: 0.5
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.401 – 0.5 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.67 (min)	4.32
16.	5.39
20.	10.8
25.	19.8
27.30 (max)	22.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.98 (min)	14.6
8.	14.7
9.	18.5
10.	23.7
13.	43.0
16.	57.7
20.	87.0
22.70 (max)	102.

RMS % Error	Life Prediction Ratio Summary
2.50	0. .5 .8 1.25 2.

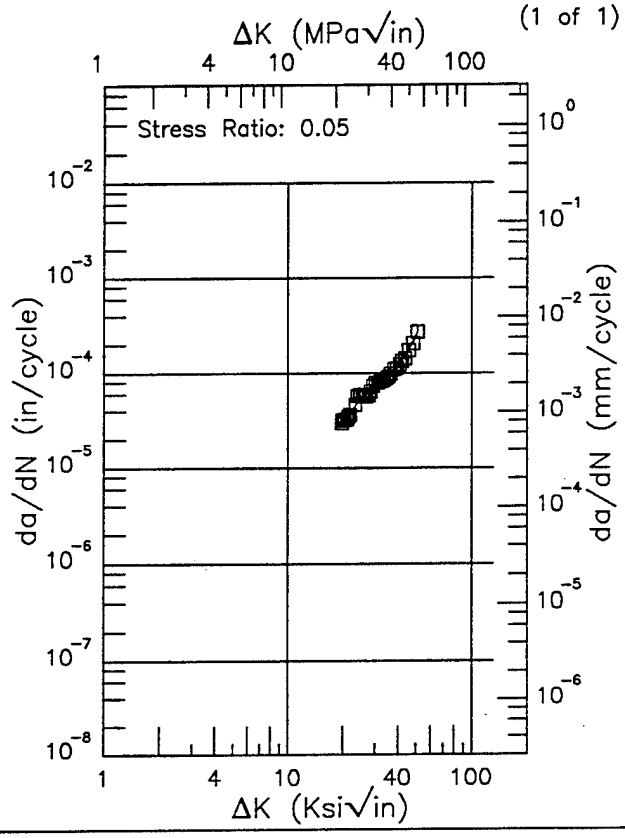
RMS % Error	Life Prediction Ratio Summary
2.79	0. .5 .8 1.25 2.

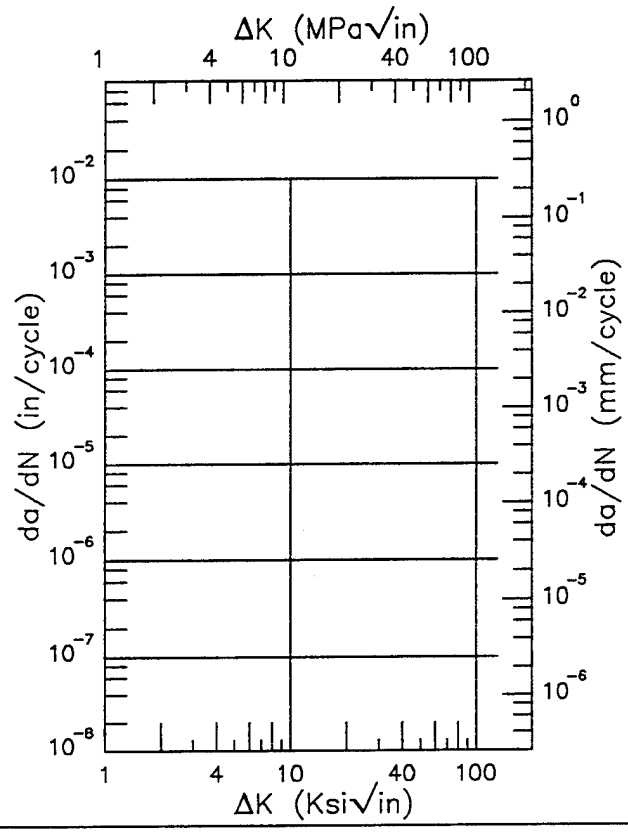
Figure 5.4.3.1.1

IN100 R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.5 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.64 (min)	27.2
20.	29.2
25.	54.2
30.	72.8
35.	91.2
40.	118.
50.	244.
50.85 (max)	263.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 5.90

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

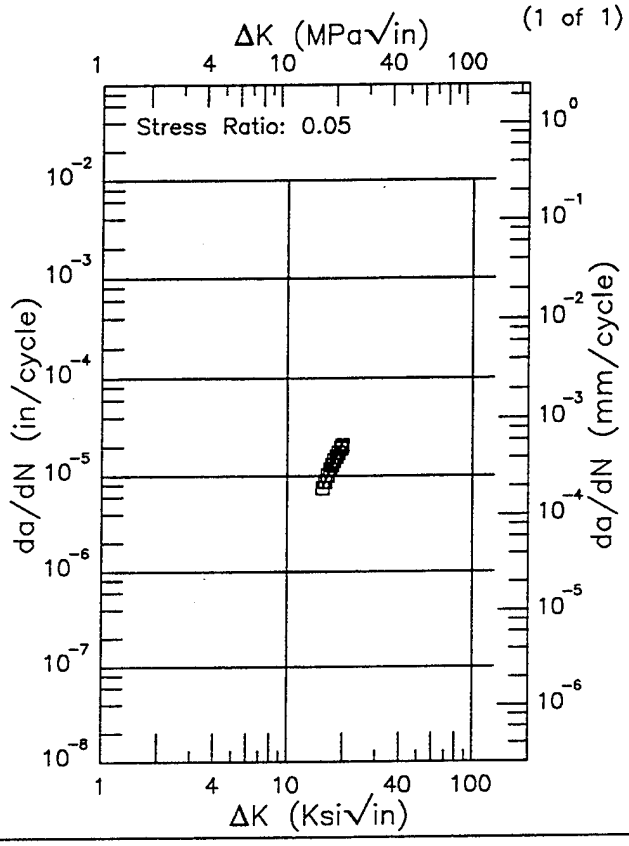
Life Prediction Ratio Summary
0. .5 .8 1.25 2.

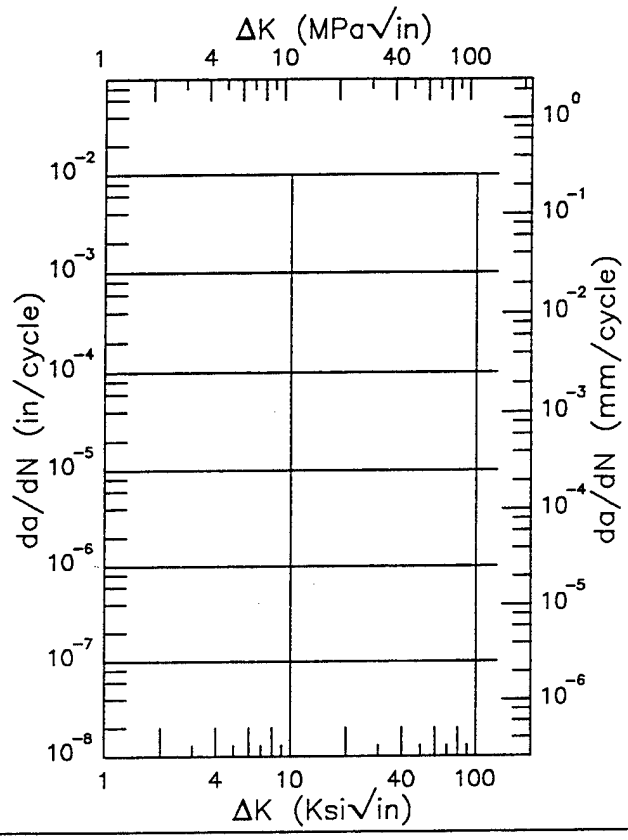
Figure 5.4.3.1.2

R IN100

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.826 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.48 (min)	7.37
16.	8.70
19.71 (max)	20.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
3.41	0. .5 .8 1.25 2.

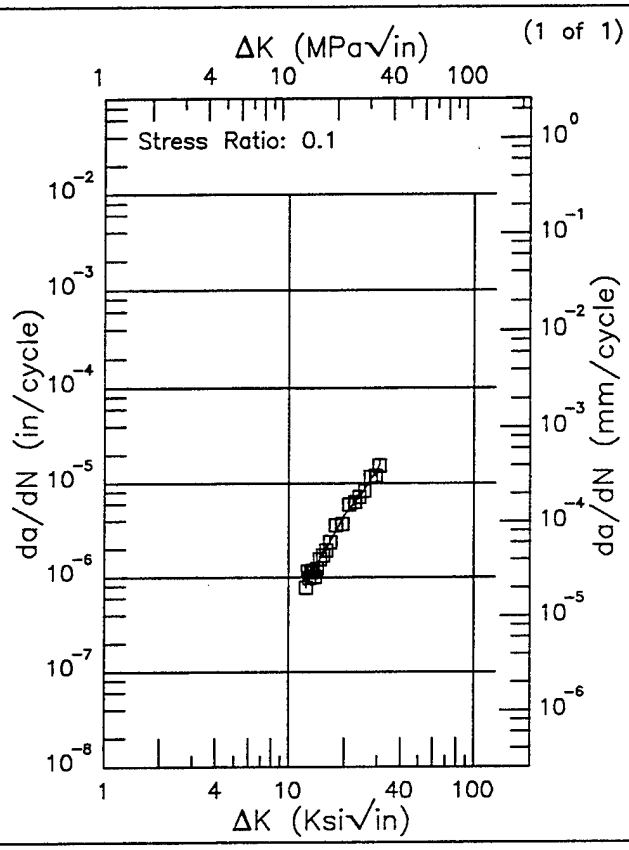
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

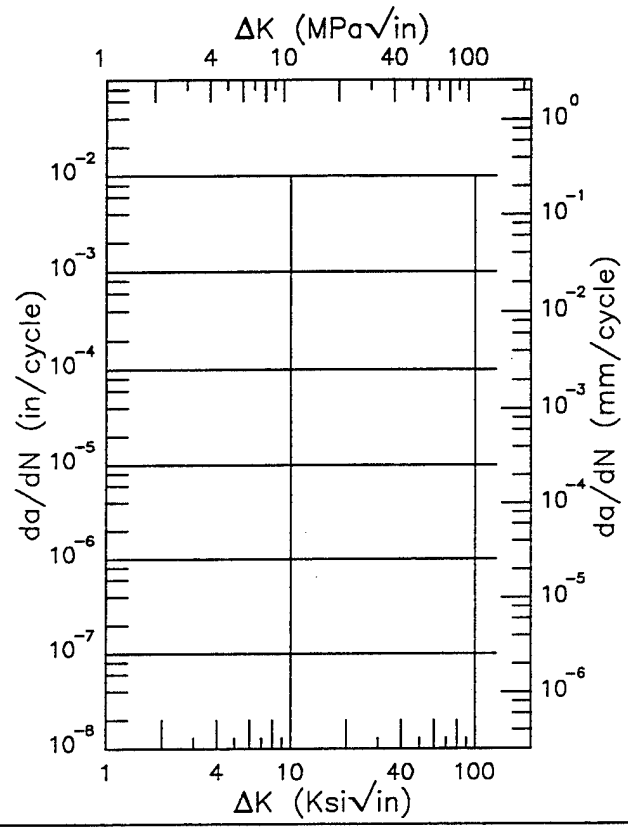
Figure 5.4.3.1.3

IN100 R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR;800°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.5 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.40 (min)	0.915
13.	1.02
16.	2.01
20.	4.57
25.	8.08
30.	13.7
30.78 (max)	15.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
9.45	0. .5 .8 1.25 2.

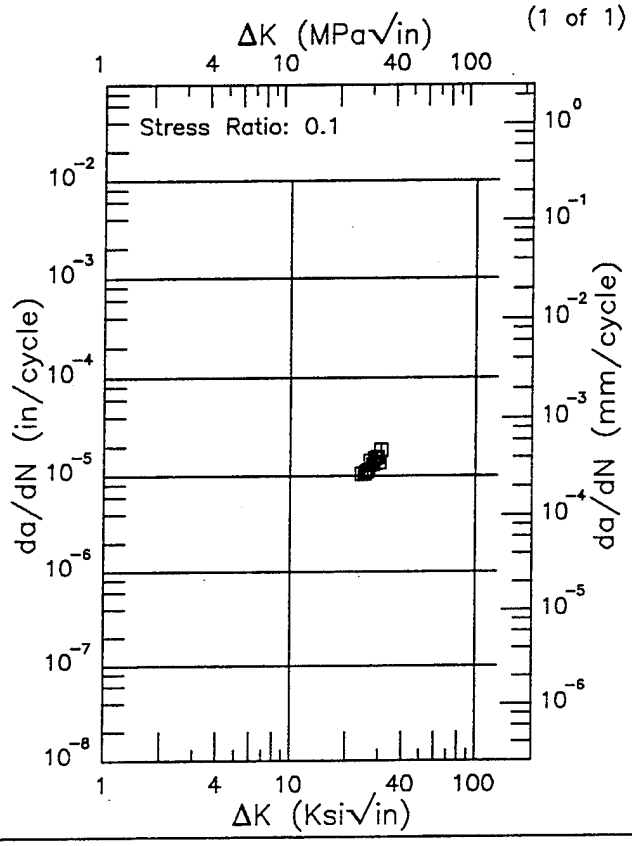
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

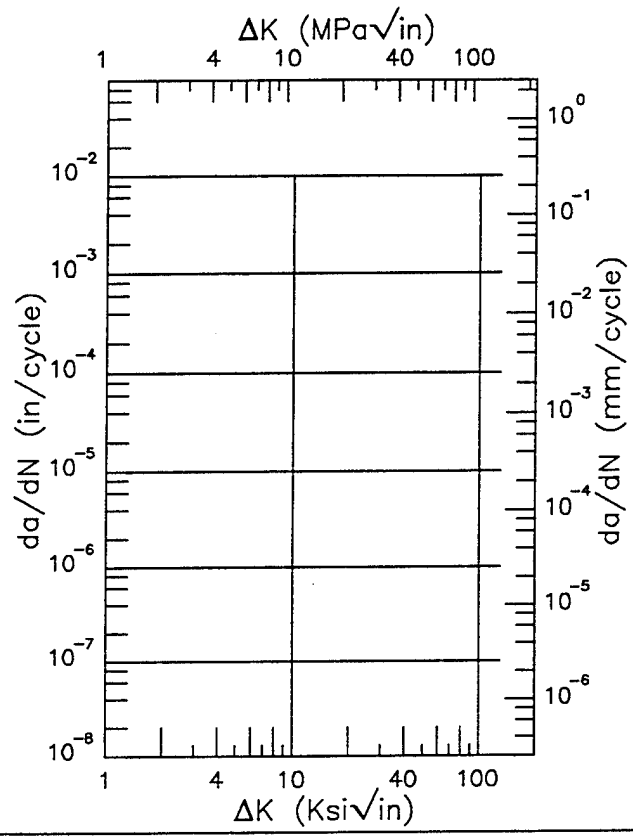
Figure 5.4.3.1.4

R IN100

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.108 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
24.21 (min)	10.0
25.	10.6
30.	15.5
30.86 (max)	15.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
8.06	0. .5 .8 1.25 2.

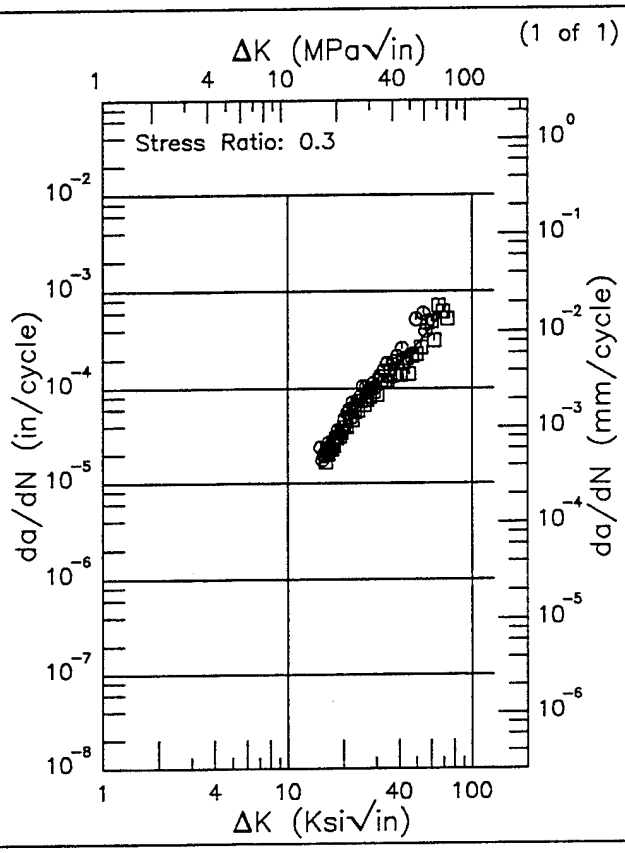
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

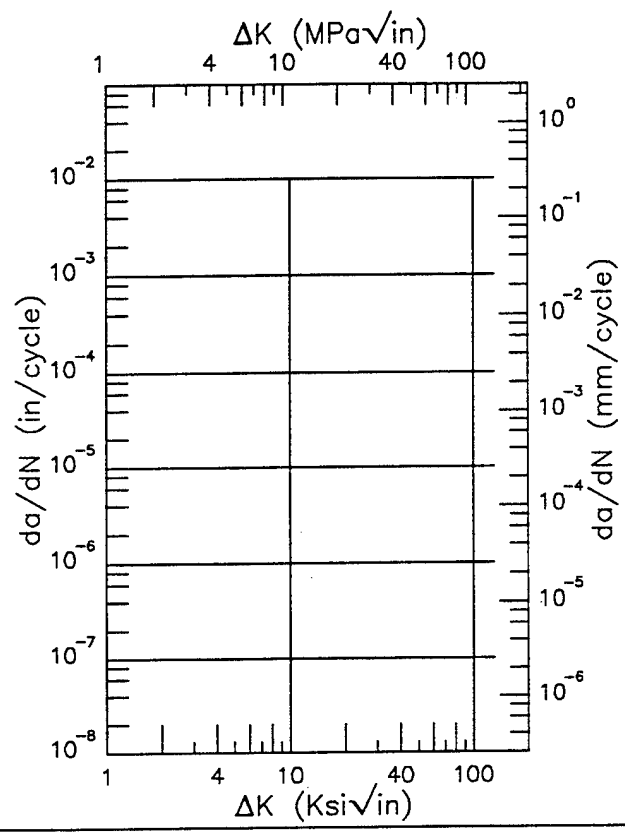
Figure 5.4.3.1.5

IN100 R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 0. Hz
Environment: LAB AIR;1100°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.251 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.98 (min)	15.9
16.	20.4
20.	41.9
25.	73.4
30.	107.
35.	143.
40.	183.
50.	283.
60.	429.
70.	650.
72.77 (max)	731.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
21.34	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

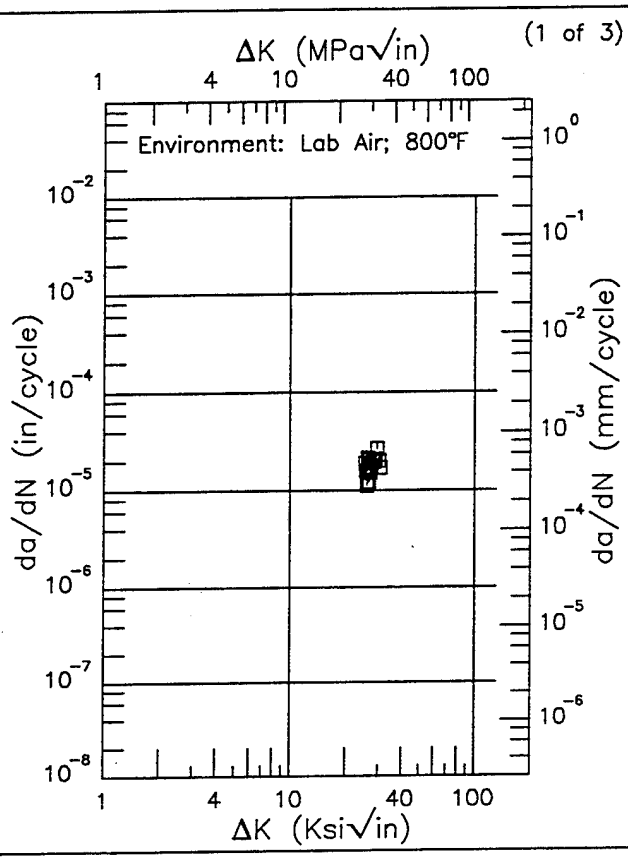
Figure 5.4.3.1.6

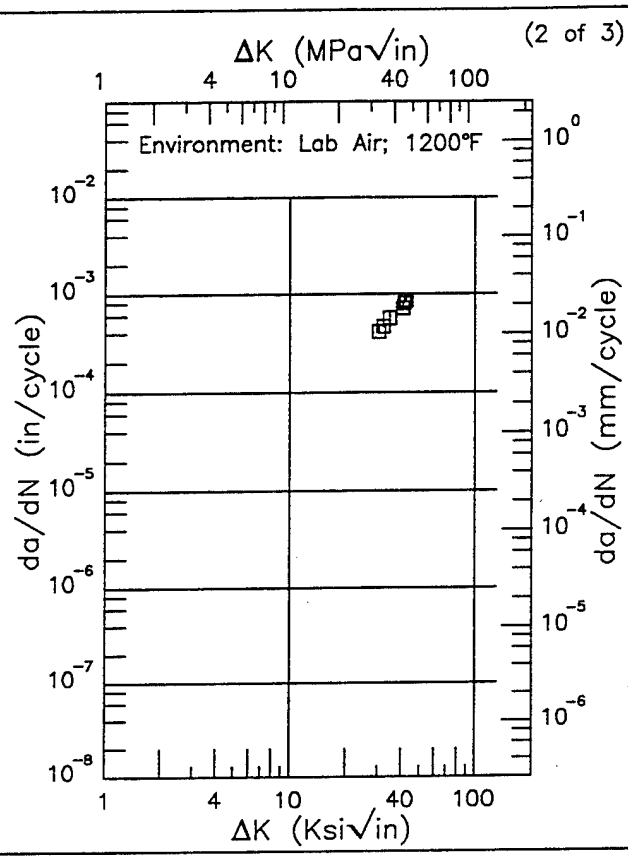
IN100

E

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency:

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.246 – 0.461 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.35 (min)	17.2
30.	21.0
30.46 (max)	18.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
17.50	0. .5 .8 1.25 2.

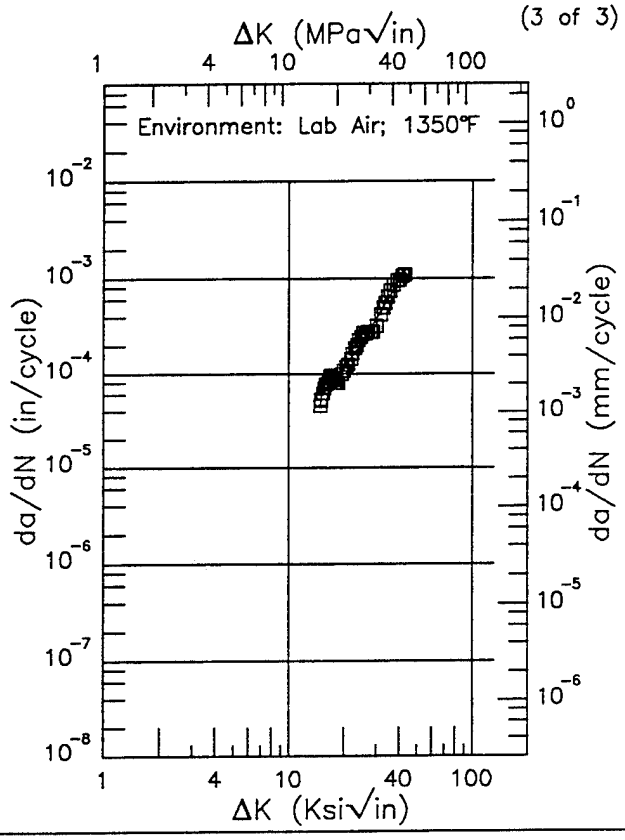
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

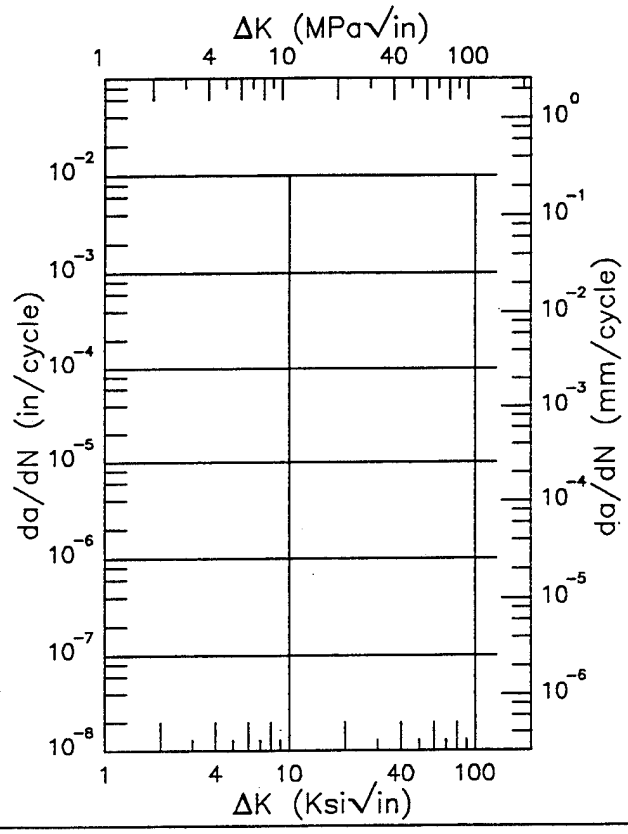
Figure 5.4.3.1.7

IN100 E

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency:

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.246 – 0.461 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.82 (min)	60.0
16.	69.9
20.	117.
25.	217.
30.	378.
35.	623.
40.	977.
42.68 (max)	1221.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.70	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

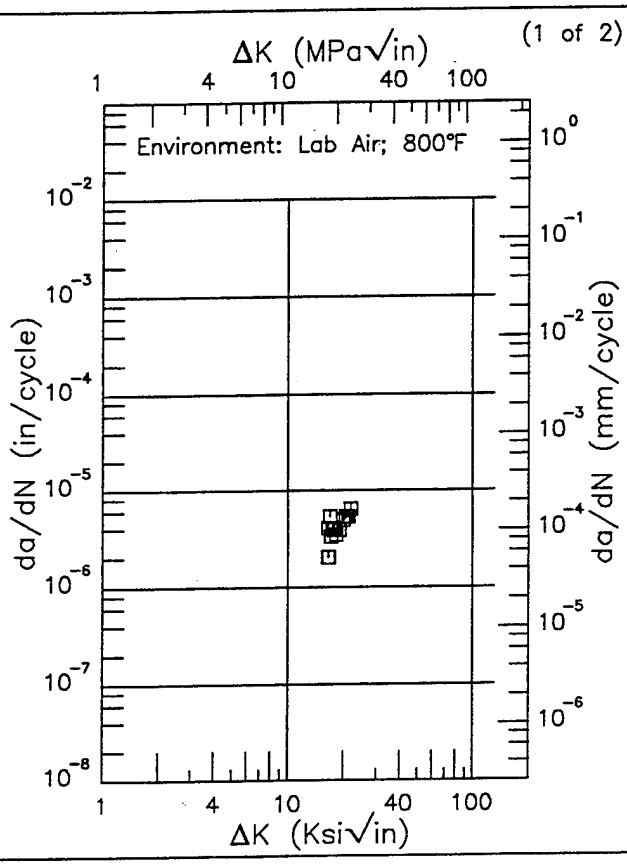
Figure 5.4.3.1.7 (Concluded)

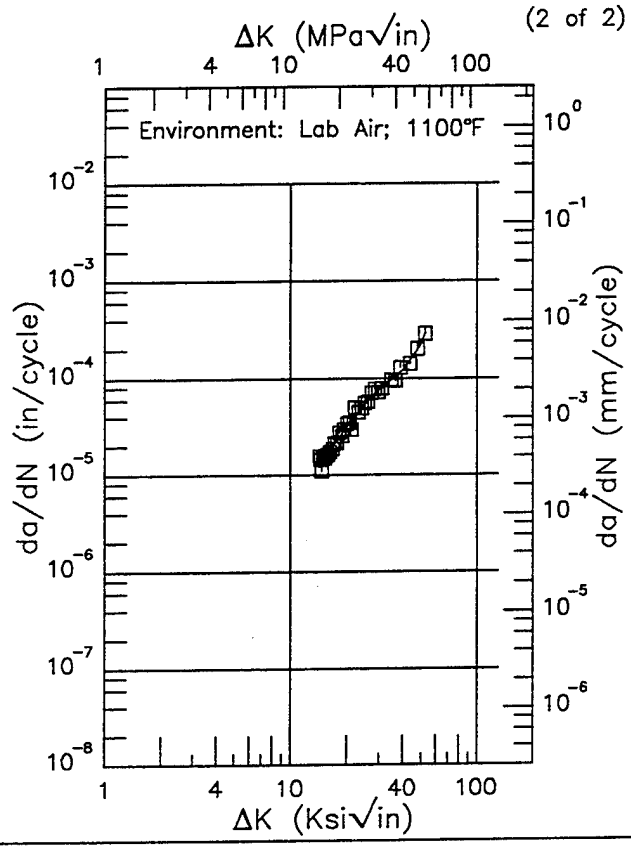
IN100

E

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.5 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.43 (min)	3.24
20.	4.71
21.80 (max)	6.30

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.26 (min)	12.0
16.	17.0
20.	31.7
25.	54.1
30.	77.7
35.	99.7
40.	123.
50.	227.
52.90 (max)	293.

RMS % Error	Life Prediction Ratio Summary
22.81	0. .5 .8 1.25 2.

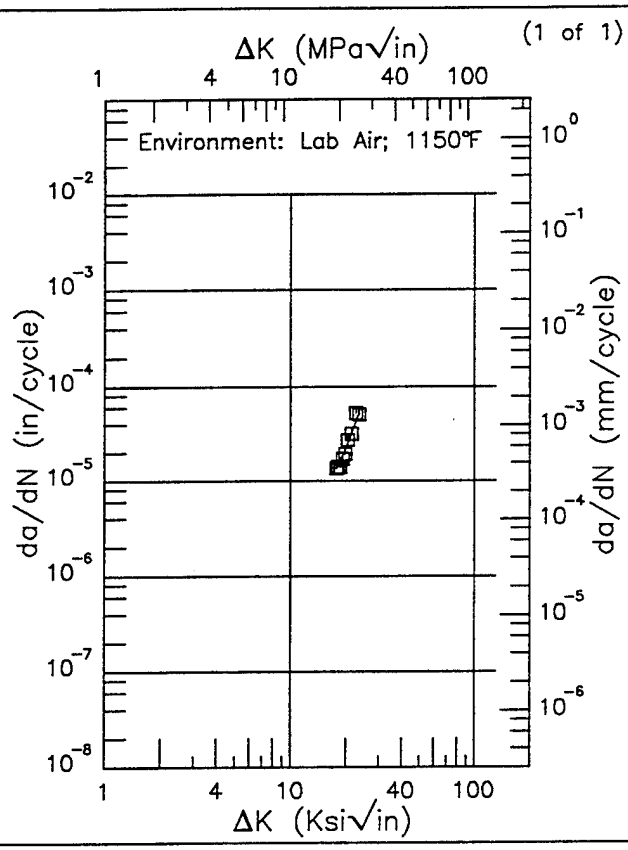
RMS % Error	Life Prediction Ratio Summary
9.91	0. .5 .8 1.25 2.

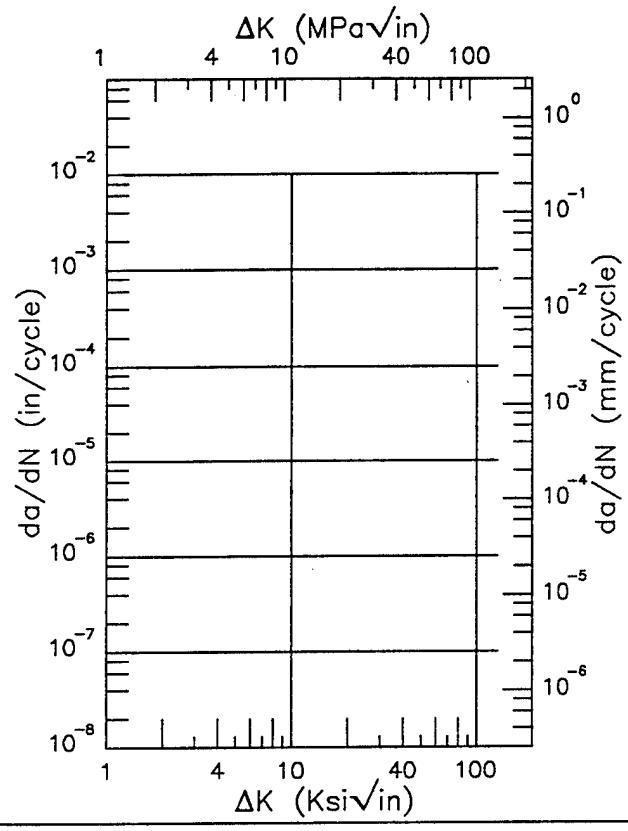
Figure 5.4.3.1.8

IN100 E

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.25 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.57 (min)	13.7
20.	22.2
23.45 (max)	53.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
10.89	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

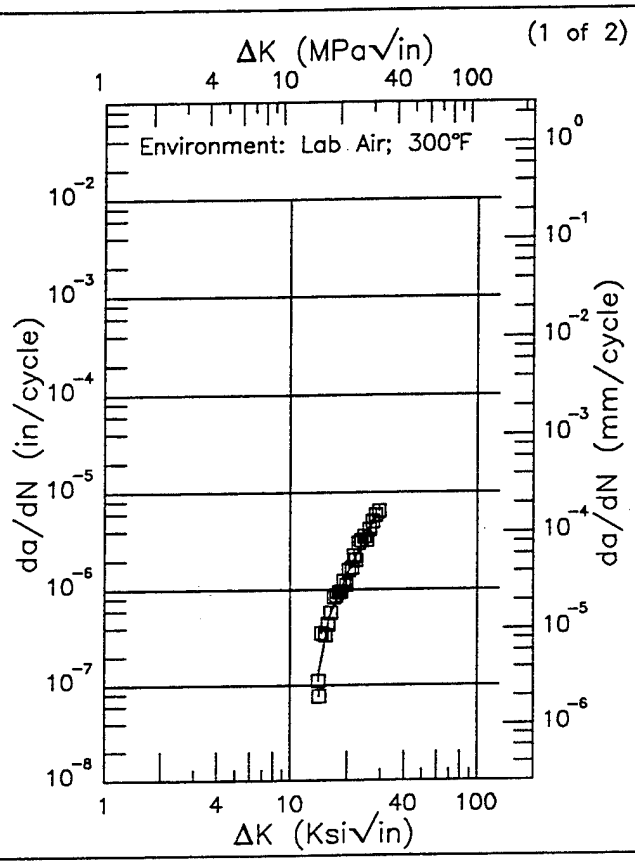
Figure 5.4.3.1.9

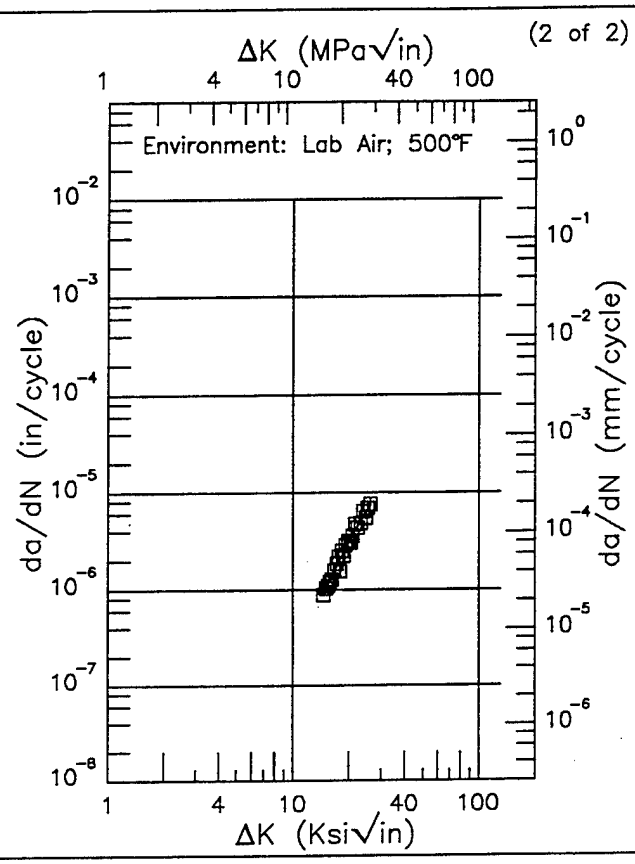
IN100

E

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength:
Ult. Strength:
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.09 (min)	0.130
16.	0.507
20.	1.43
25.	3.67
29.38 (max)	5.88

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.58 (min)	0.871
16.	1.30
20.	3.12
25.	6.47
26.09 (max)	7.31

RMS % Error	Life Prediction Ratio Summary
20.62	0. .5 .8 1.25 2.

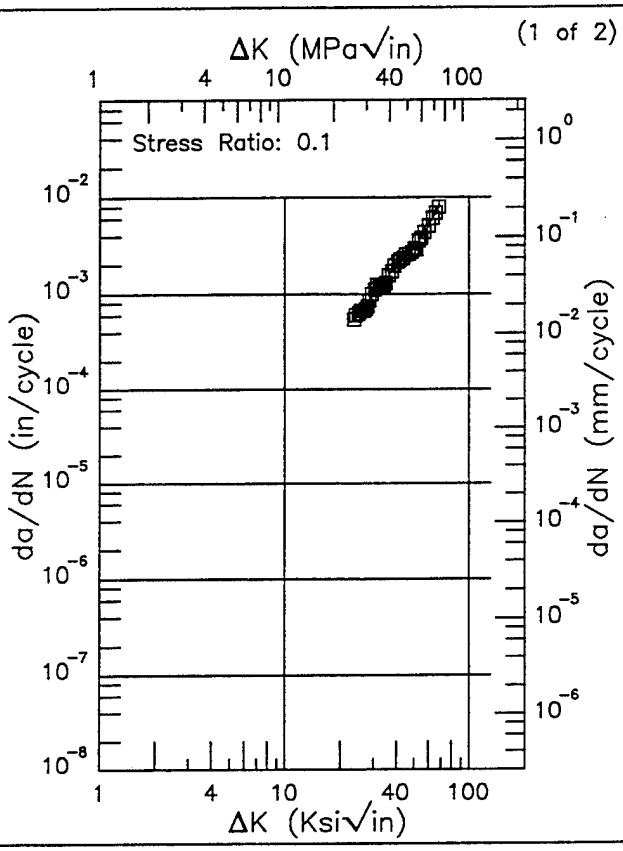
RMS % Error	Life Prediction Ratio Summary
9.28	0. .5 .8 1.25 2.

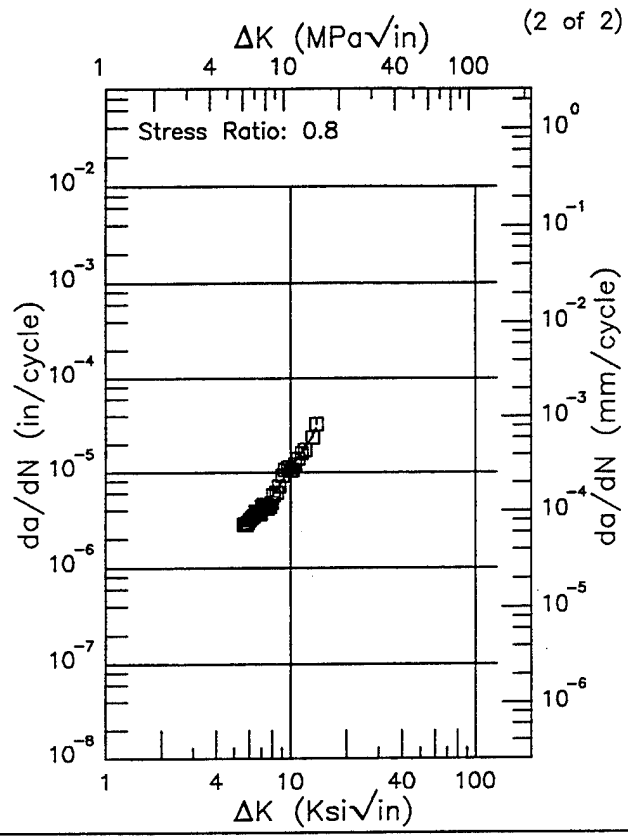
Figure 5.4.3.1.10

IN100 R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation:
Frequency: 0.2 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.252 – 0.302 in.
Specimen Width: 2.503 – 2.504 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.52 (min)	552.
25.	624.
30.	968.
35.	1434.
40.	1957.
50.	2985.
60.	5080.
67.89 (max)	7741.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.60 (min)	3.00
6.	3.04
7.	3.91
8.	5.68
9.	8.18
10.	11.0
13.	23.3
13.74 (max)	29.9

RMS % Error	Life Prediction Ratio Summary
5.85	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
8.29	0. .5 .8 1.25 2.

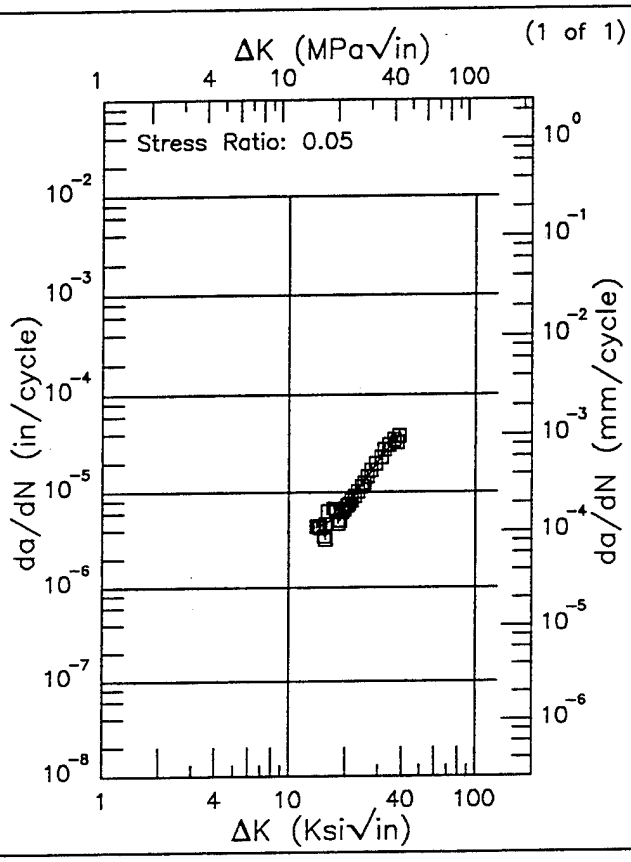
Figure 5.4.3.1.11

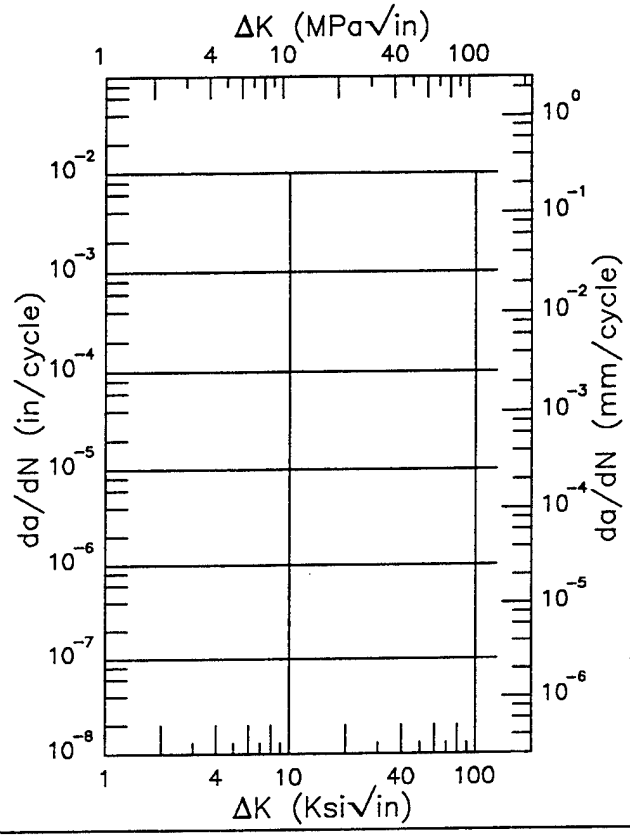
IN100

R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.249 in.
Specimen Width: 2.501 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.03 (min)	4.32
16.	4.75
20.	7.10
25.	12.6
30.	20.9
35.	30.8
38.78 (max)	38.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 12.63

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

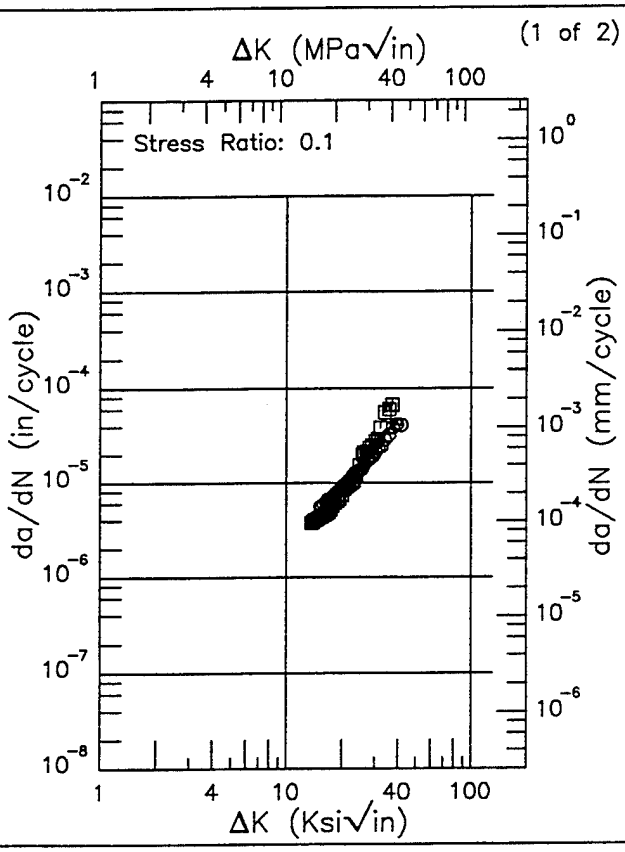
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

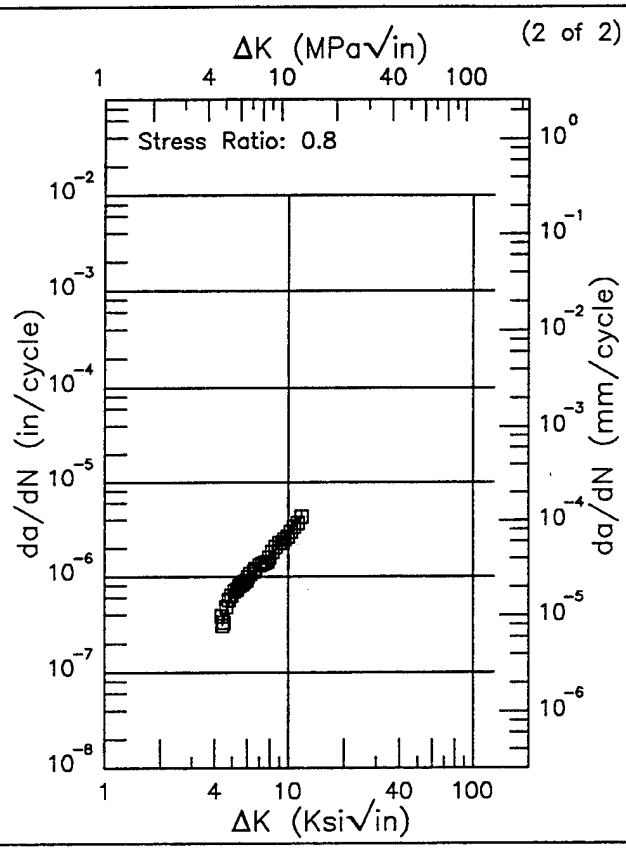
Figure 5.4.3.1.12

IN100 R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.206 – 0.442 in.
Specimen Width: 2.494 – 2.508 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.55 (min)	3.94
16.	4.92
20.	8.16
25.	15.2
30.	25.3
35.	36.6
40.	46.6
41.45 (max)	49.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.39 (min)	0.346
5.	0.613
6.	0.990
7.	1.29
8.	1.63
9.	2.14
10.	2.81
11.78 (max)	4.09

RMS % Error 17.40

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error 6.08

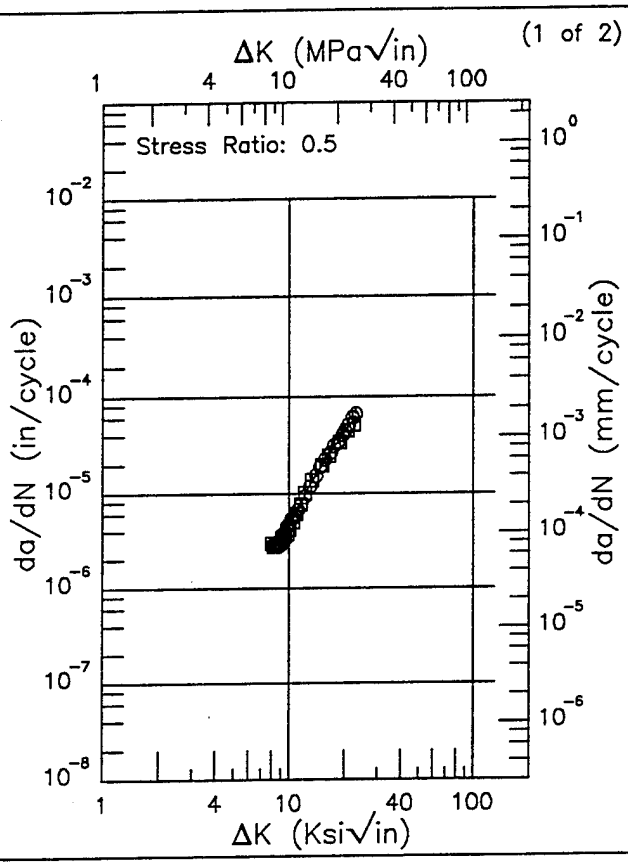
Life Prediction Ratio Summary
0. .5 .8 1.25 2.

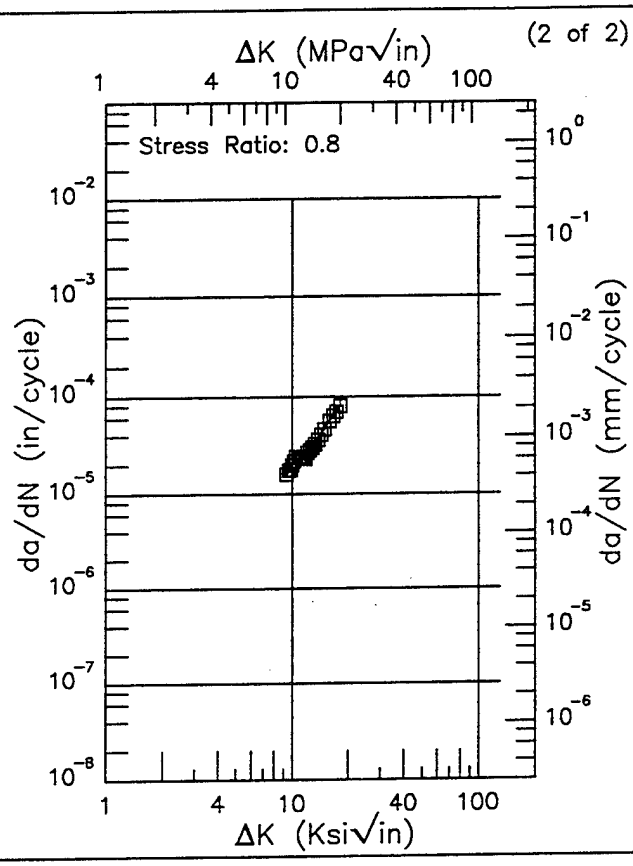
Figure 5.4.3.1.13

R IN100

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Frequency: 0.2 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.5 – 0.503 in.
Specimen Width: 2.496 – 2.505 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.06 (min)	2.69
9.	3.22
10.	4.41
13.	12.1
16.	23.2
20.	43.0
22.91 (max)	62.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.28 (min)	15.4
10.	20.4
13.	30.3
16.	57.3
18.16 (max)	80.1

RMS % Error	Life Prediction Ratio Summary
5.87	0. .5 .8 1.25 2.

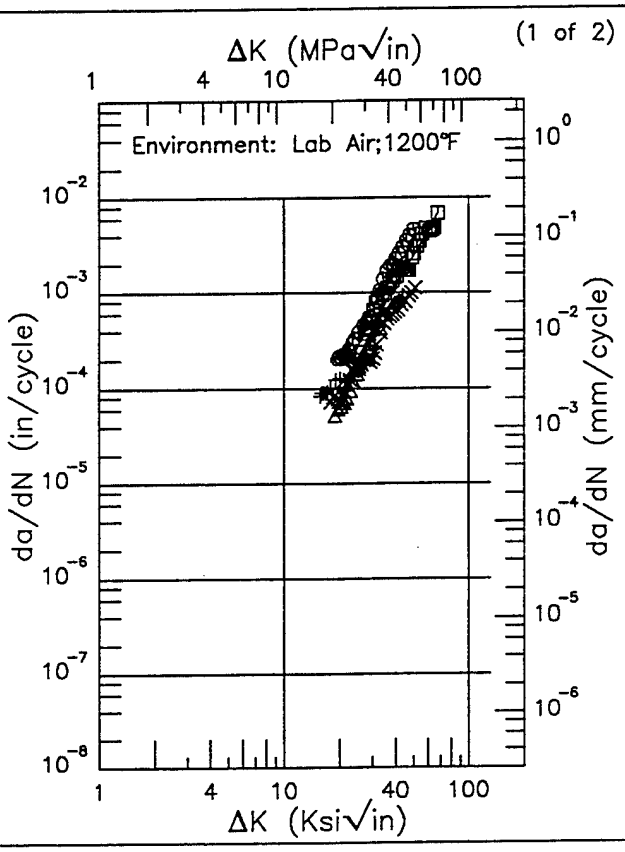
RMS % Error	Life Prediction Ratio Summary
4.32	0. .5 .8 1.25 2.

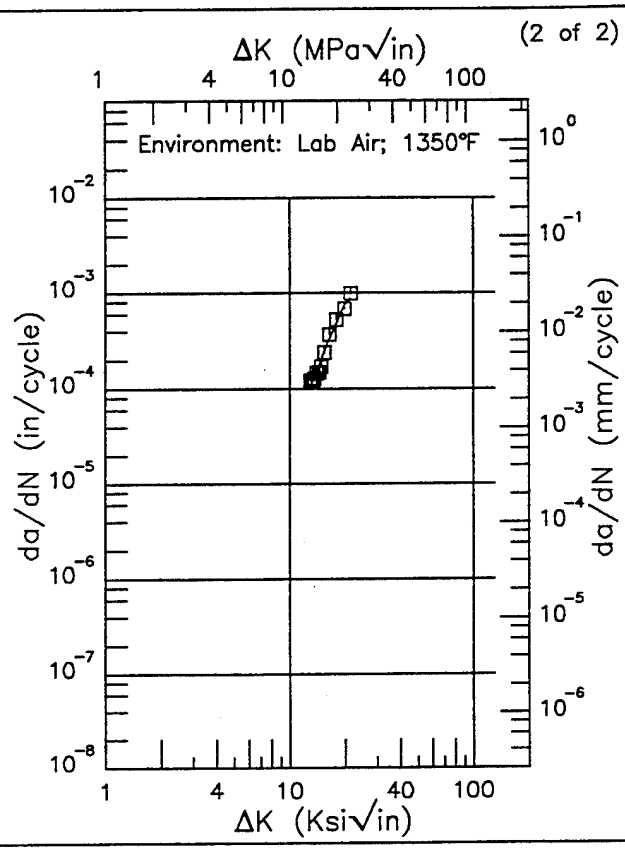
Figure 5.4.3.1.14

IN100 E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency:

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.25 – 0.856 in.
Specimen Width: 2.436 – 2.51 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.61 (min)	85.6
16.	84.7
20.	106.
25.	203.
30.	408.
35.	755.
40.	1237.
50.	2413.
60.	4198.
67.35 (max)	6600.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.93 (min)	105.
13.	107.
16.	293.
20.	776.
21.29 (max)	871.

RMS % Error	Life Prediction Ratio Summary
47.00	Δ × + ⊡ ⊙ — 0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
10.90	⊡ — 0. .5 .8 1.25 2.

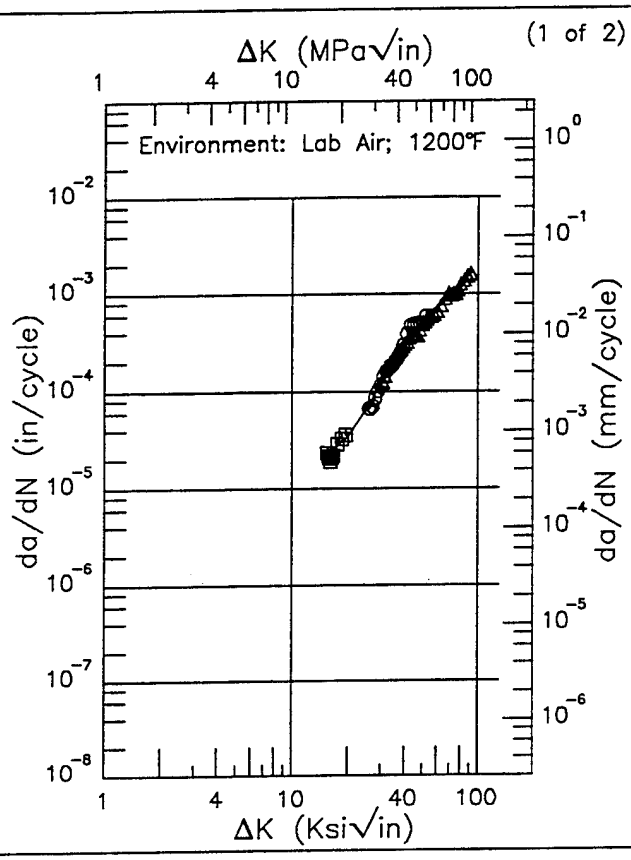
Figure 5.4.3.1.15

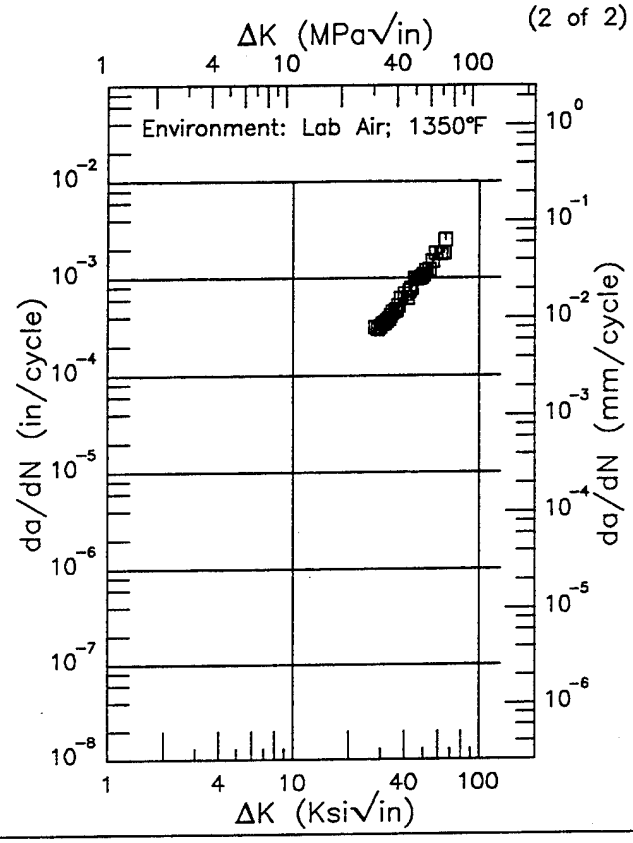
IN100

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 0. Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.25 – 0.469 in.
Specimen Width: 2.437 – 2.511 in.
Ref: PW006;PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.43 (min)	22.7
16.	23.4
20.	34.7
25.	65.7
30.	120.
35.	199.
40.	295.
50.	497.
60.	700.
70.	927.
80.	1207.
90.	1569.
91.39 (max)	1628.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.86 (min)	281.
30.	322.
35.	452.
40.	630.
50.	1117.
60.	1699.
65.70 (max)	2019.

RMS % Error	Life Prediction Ratio Summary
9.35	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
6.80	0. .5 .8 1.25 2.

Figure 5.4.3.1.16

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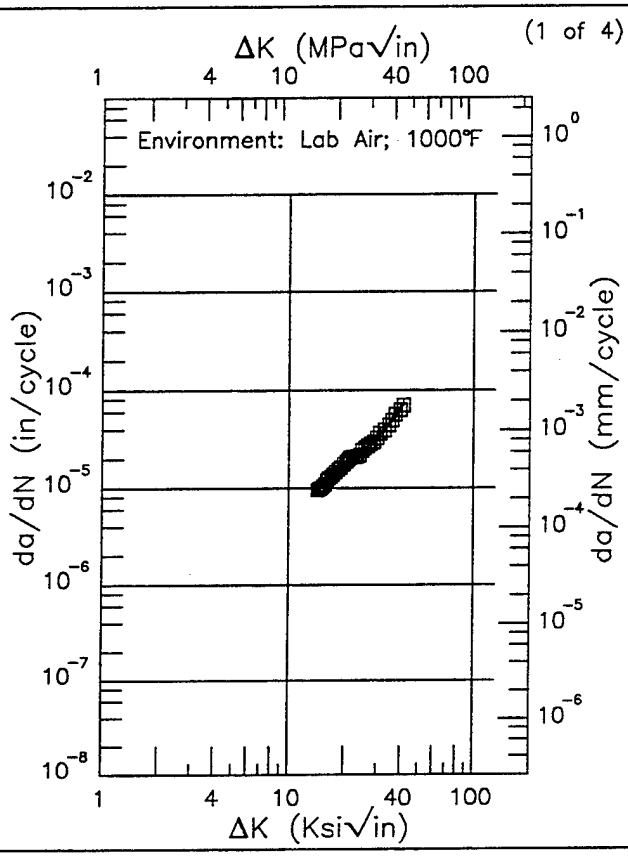
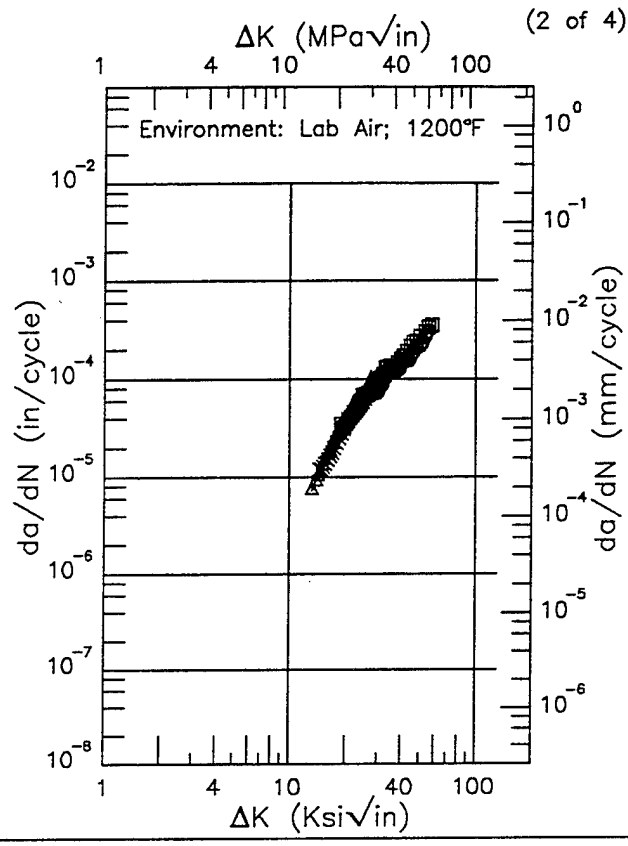
IN100

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.25 – 0.87 in.
Specimen Width: 2.493 – 2.511 in.
Ref: PW002;PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.22 (min)	9.13
16.	11.9
20.	17.6
25.	24.6
30.	33.2
35.	45.8
40.	65.2
41.33 (max)	72.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.17 (min)	7.25
16.	16.9
20.	35.3
25.	61.9
30.	89.9
35.	120.
40.	153.
50.	239.
57.86 (max)	338.

RMS % Error	Life Prediction Ratio Summary
2.53	0. .5 .8 1.25 2.

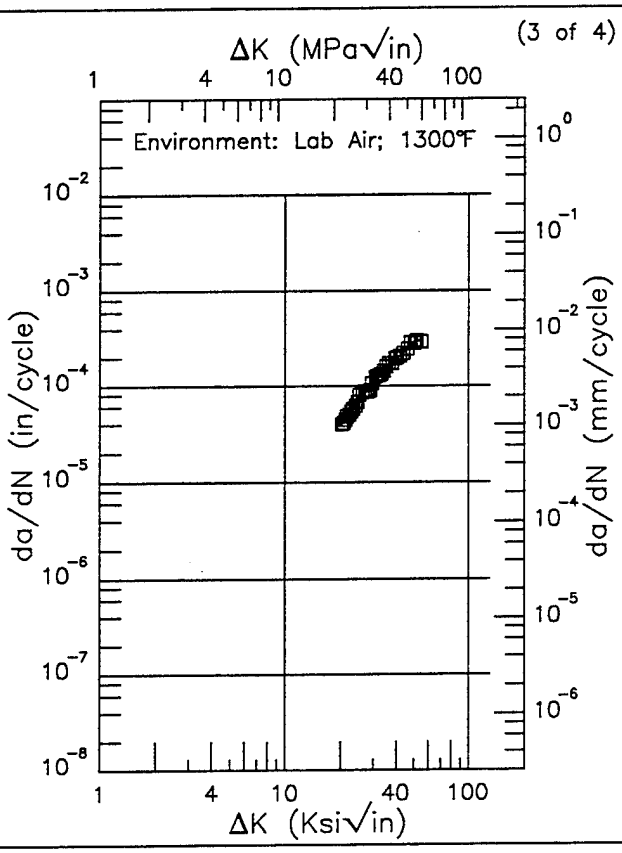
RMS % Error	Life Prediction Ratio Summary
10.05	0. .5 .8 1.25 2.

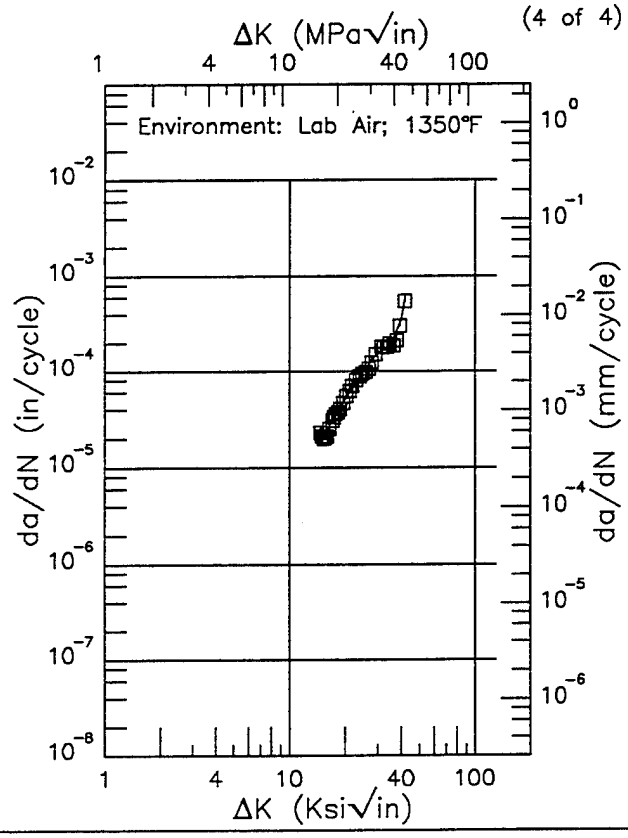
Figure 5.4.3.1.17

IN100 E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.25 – 0.87 in.
Specimen Width: 2.493 – 2.511 in.
Ref: PW002;PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.20 (min)	39.0
25.	70.7
30.	110.
35.	153.
40.	197.
50.	280.
54.45 (max)	313.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.68 (min)	17.7
16.	24.3
20.	50.8
25.	99.7
30.	157.
35.	186.
40.	355.
41.46 (max)	546.

RMS % Error	Life Prediction Ratio Summary
4.18	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
8.64	0. .5 .8 1.25 2.

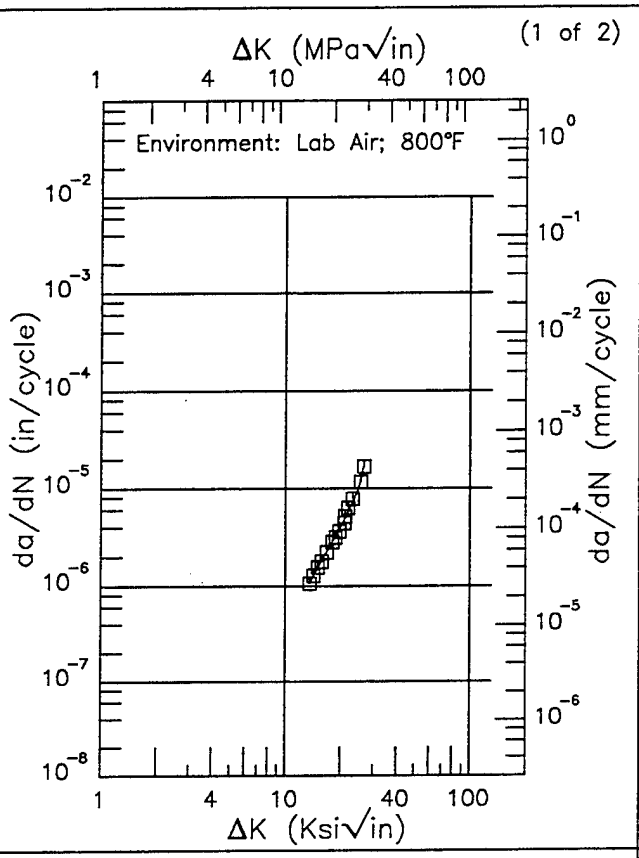
Figure 5.4.3.1.17 (Concluded)

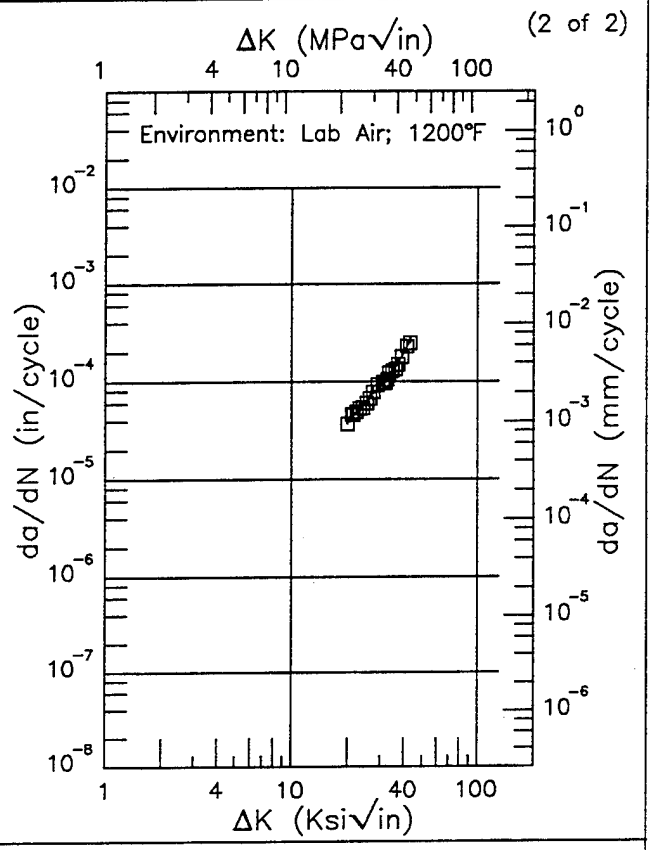
IN100

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: −1
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.298 − 0.299 in.
Specimen Width: 0.995 − 1 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.48 (min)	1.06
16.	1.96
20.	3.97
25.	10.3
26.54 (max)	16.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.84 (min)	37.8
20.	38.5
25.	62.4
30.	91.0
35.	132.
40.	196.
42.98 (max)	253.

RMS % Error	Life Prediction Ratio Summary
3.39	0. .5 .8 1.25 2.

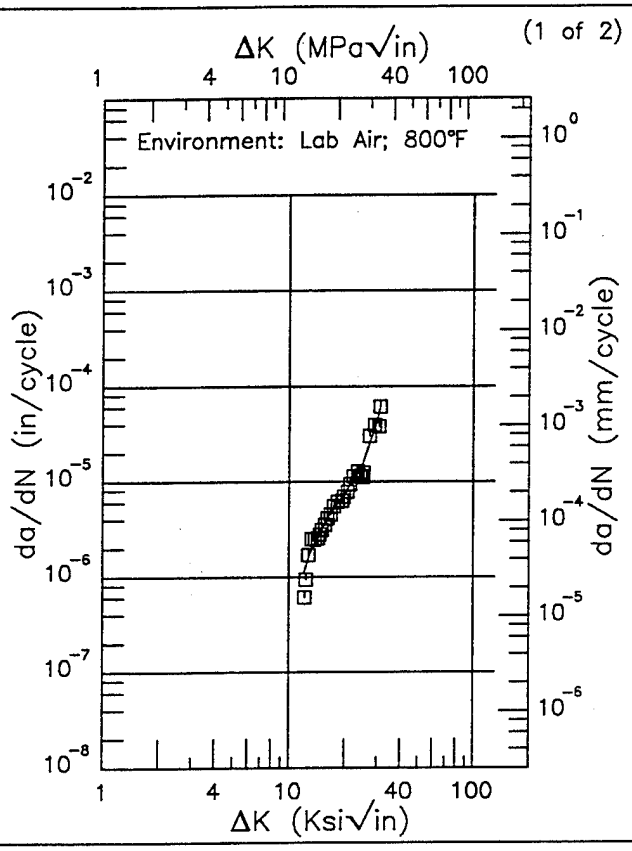
RMS % Error	Life Prediction Ratio Summary
4.70	0. .5 .8 1.25 2.

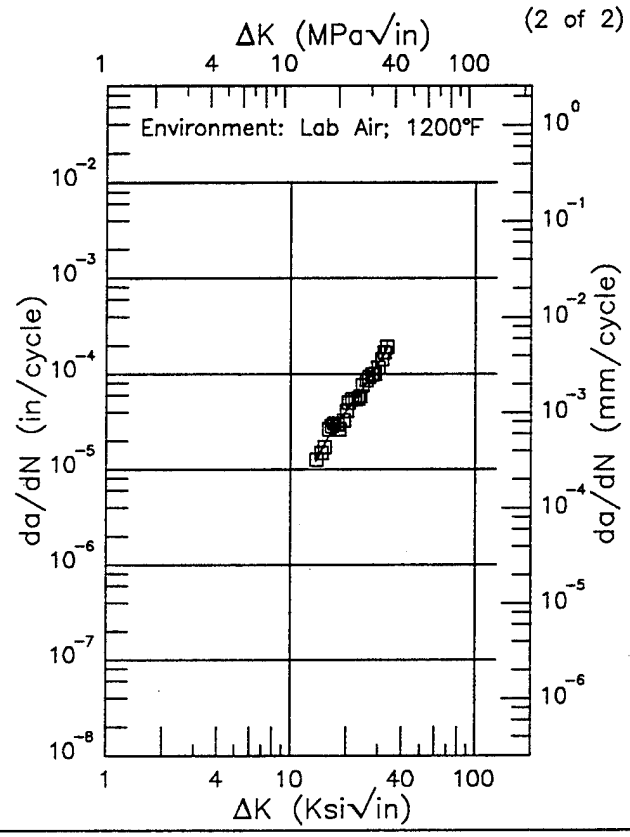
Figure 5.4.3.1.18

IN100 E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: −0.5
Frequency: 0.2 Hz

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.228 − 0.309 in.
Specimen Width: 0.988 − 1.038 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.10 (min)	1.13
13.	1.75
16.	4.11
20.	7.40
25.	15.4
30.	44.4
31.05 (max)	58.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.75 (min)	12.2
16.	21.5
20.	41.1
25.	73.7
30.	128.
33.24 (max)	186.

RMS % Error 16.76

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error 9.05

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

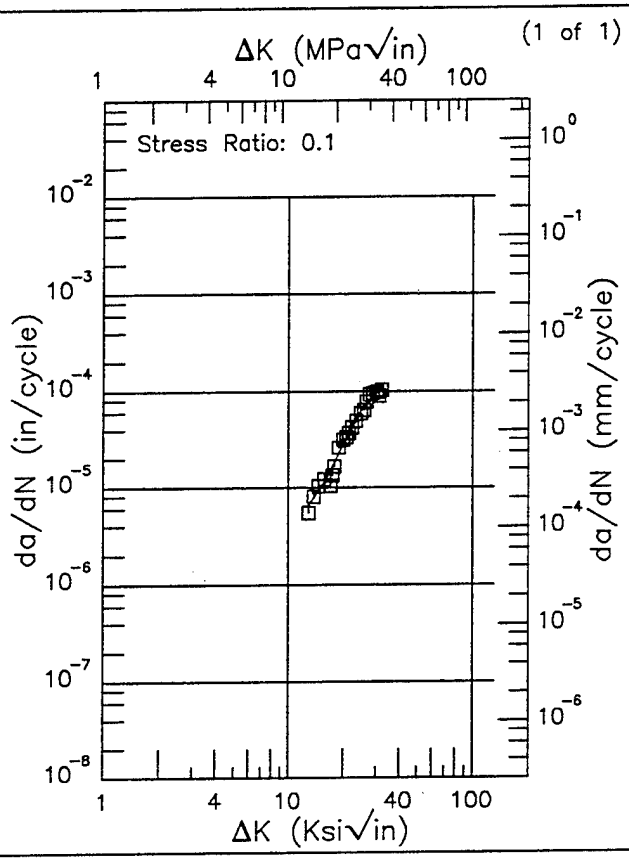
Figure 5.4.3.1.19

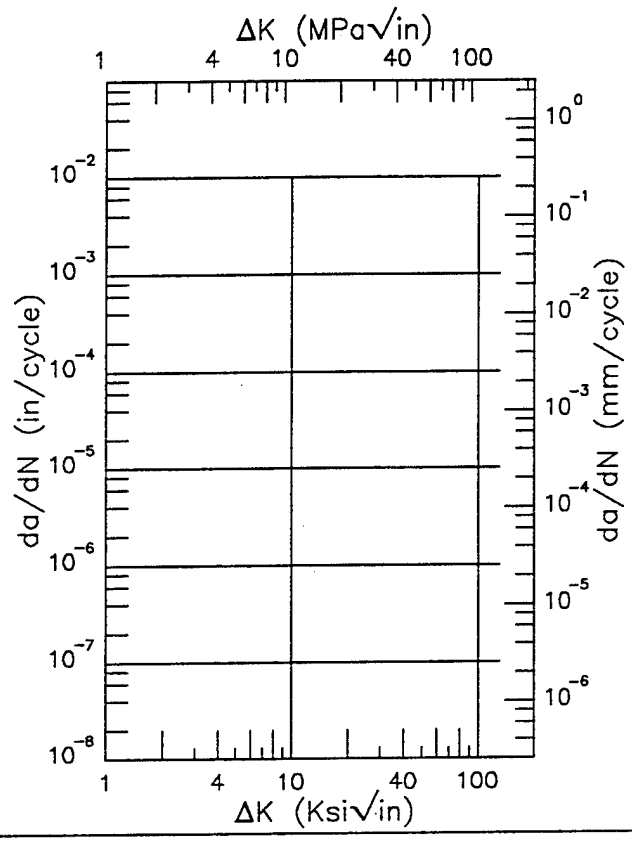
IN100

R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C–R
Frequency: 0.2 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.296 in.
Specimen Width: 0.986 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.89 (min)	6.62
13.	6.72
16.	12.0
20.	28.4
25.	64.0
30.	95.9
31.93 (max)	101.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.71	0. .5 .8 1.25 2.

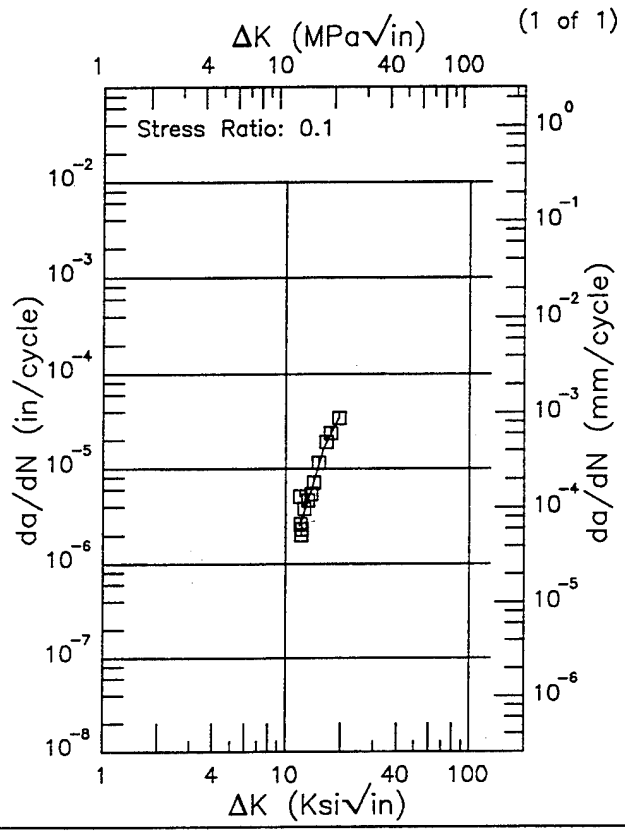
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

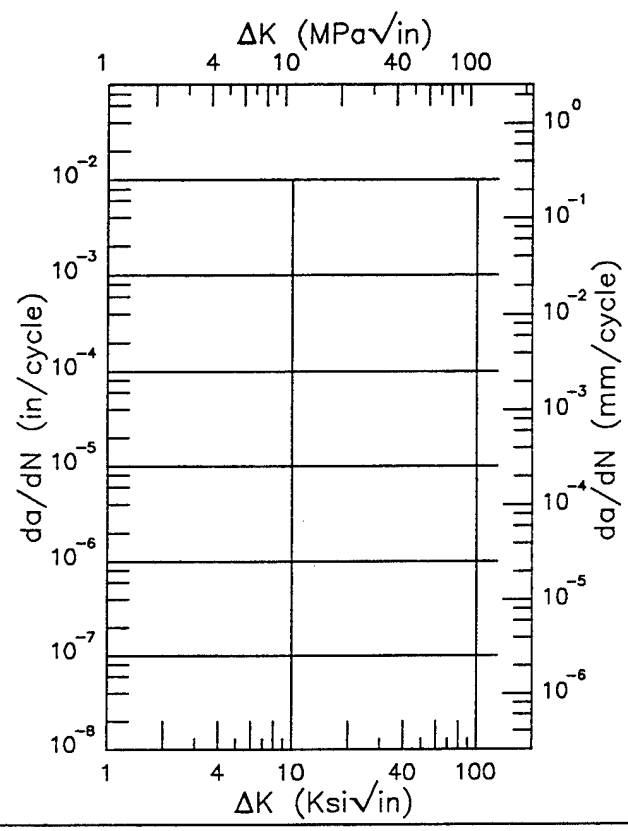
Figure 5.4.3.1.20

IN100 R

Condition/Ht: PRESTRAIN
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Frequency: 0.2 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.1 ksi
Ult. Strength: 236.5 ksi
Specimen Thk: 0.288 in.
Specimen Width: 0.722 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.89 (min)	2.52
13.	4.06
16.	15.8
19.36 (max)	34.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
30.81	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

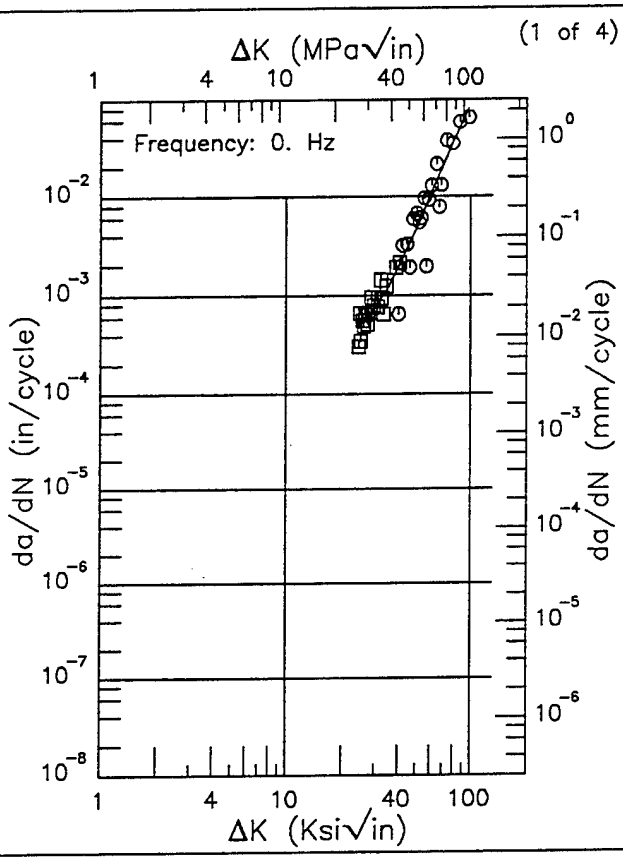
Figure 5.4.3.1.21

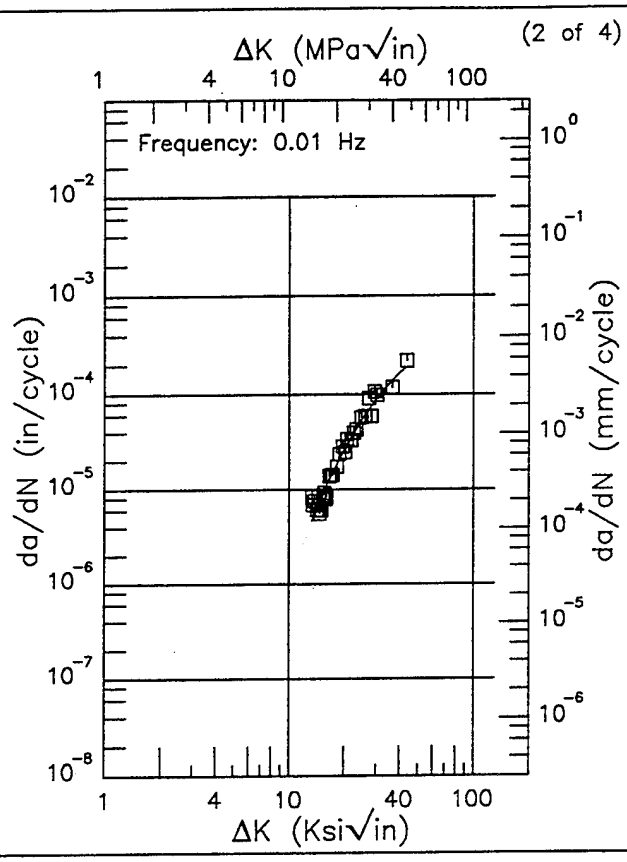
IN100 P/M-G

F

Condition/Ht: 2050F 2HRS OQ 1600F 0.67HR AC
Form: Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 158.2 ksi
Ult. Strength: 176.9 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
24.49 (min)	503.
25.	518.
30.	751.
35.	1176.
40.	1875.
50.	4591.
60.	10161.
70.	20114.
80.	35904.
90.	58501.
97.60 (max)	80363.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.36 (min)	4.70
16.	10.7
20.	25.9
25.	53.8
30.	88.7
35.	127.
40.	165.
43.75 (max)	194.

RMS % Error	Life Prediction Ratio Summary
32.41	0. .5 .8 1.25 2.

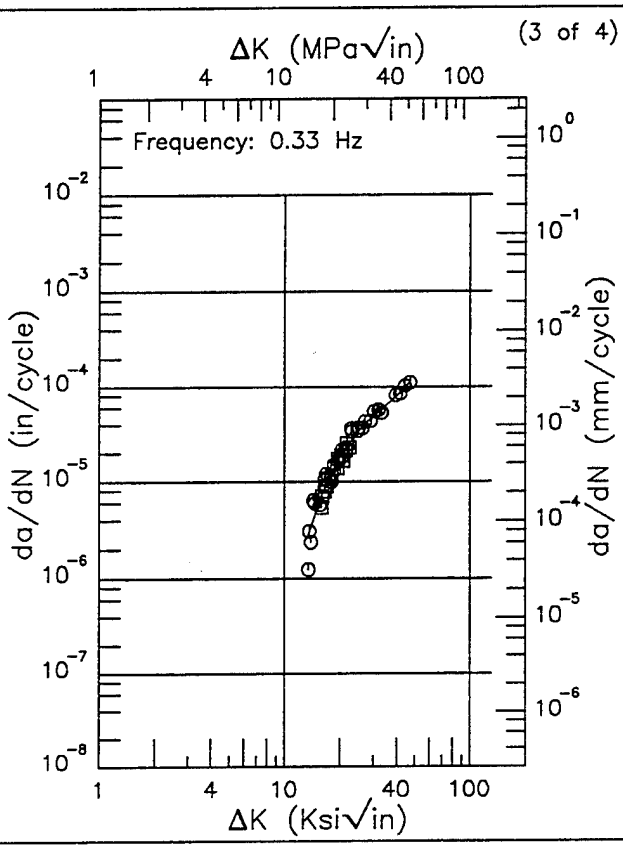
RMS % Error	Life Prediction Ratio Summary
22.51	0. .5 .8 1.25 2.

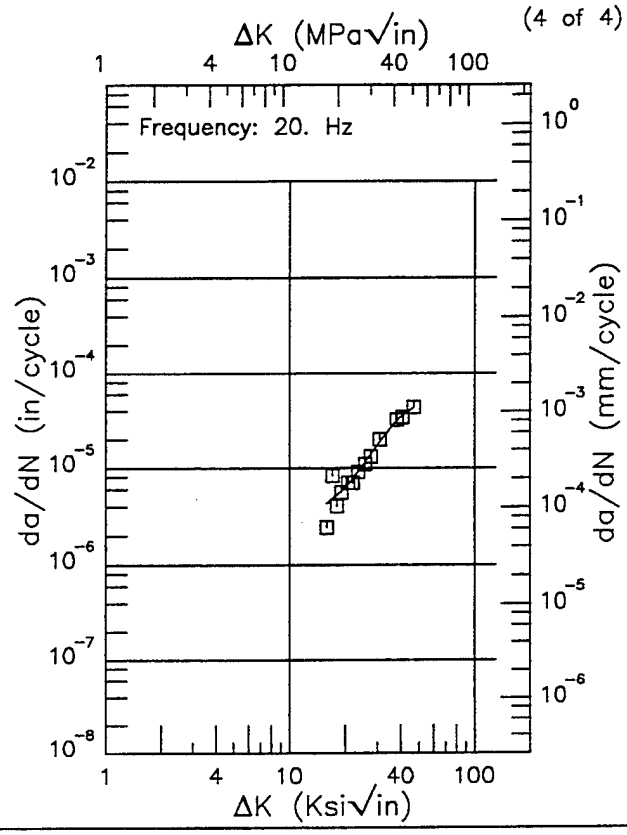
Figure 5.5.3.1

IN100 P/M-G F

Condition/Ht: 2050F 2HRS OQ 1600F 0.67HR AC
Form: Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 158.2 ksi
Ult. Strength: 176.9 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.44 (min)	2.78
16.	7.49
20.	18.5
25.	34.1
30.	49.2
35.	64.3
40.	81.4
46.90 (max)	112.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.92 (min)	4.26
16.	4.29
20.	6.15
25.	10.7
30.	17.5
35.	25.9
40.	34.5
46.70 (max)	43.3

RMS % Error	Life Prediction Ratio Summary
19.36	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
25.22	0. .5 .8 1.25 2.

Figure 5.5.3.1 (Concluded)

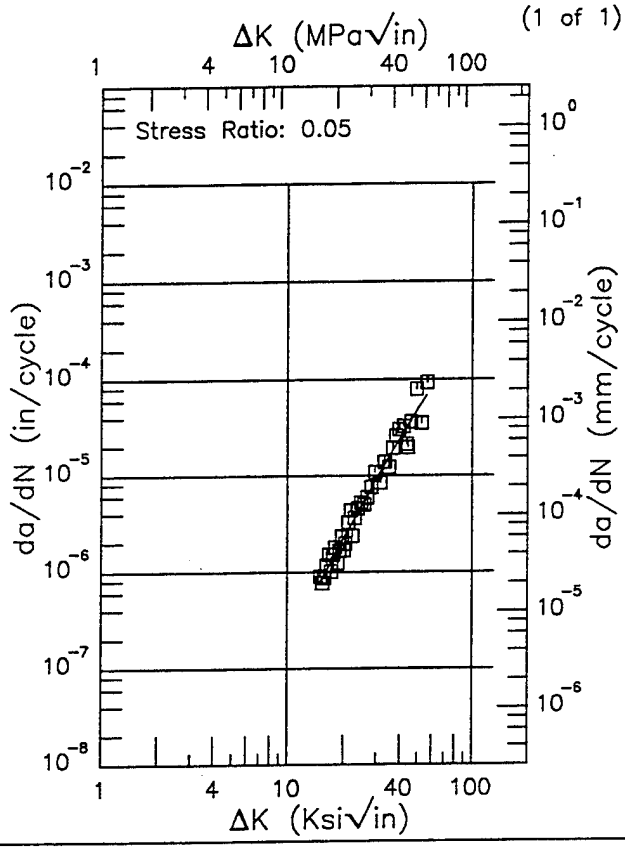
INCOLOY 901

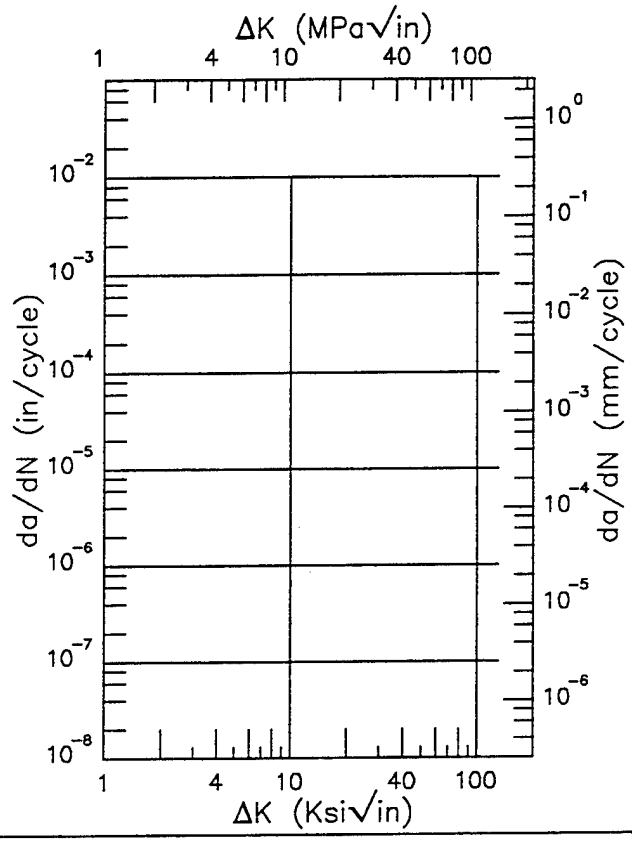
R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR;900°F

Yield Strength:
Ult. Strength:
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW003

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.89 (min)	0.779
16.	1.00
20.	2.20
25.	4.87
30.	9.23
35.	15.6
40.	24.3
50.	48.7
56.30 (max)	68.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
24.06	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.6.3.1

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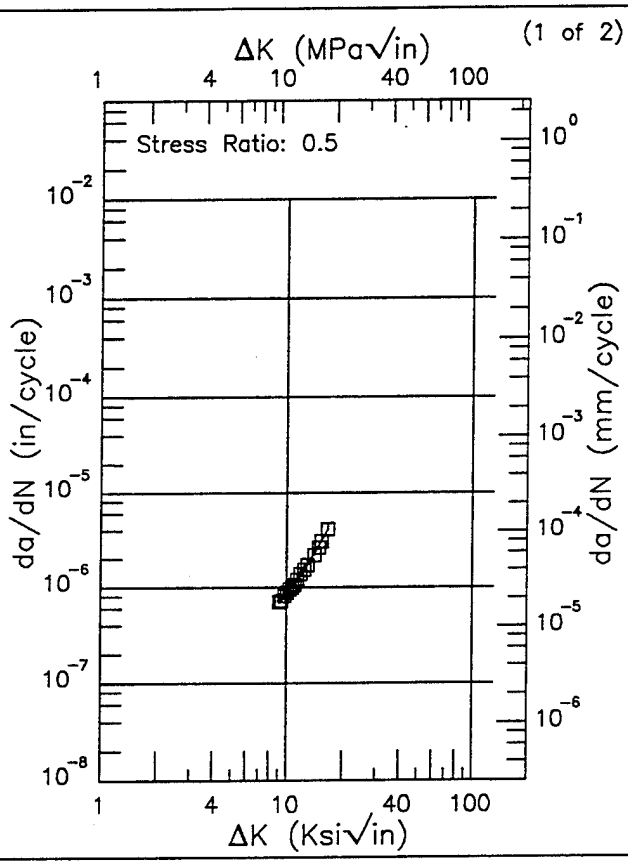
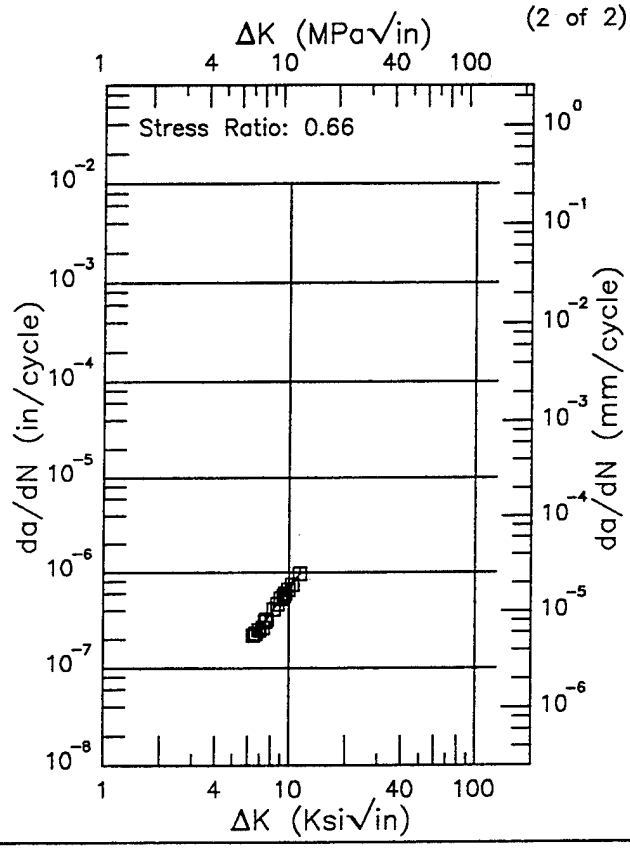
R

INCONEL 600

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Frequency: 6.7 Hz
Environment: LAB AIR;1000°F

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.41 – 0.413 in.
Specimen Width: 2.002 – 2.004 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.14 (min)	0.688
10.	0.861
13.	1.73
16.	3.53
16.53 (max)	4.03

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.43 (min)	0.215
7.	0.251
8.	0.368
9.	0.521
10.	0.674
11.40 (max)	0.955

RMS % Error	Life Prediction Ratio Summary
2.32	0. .5 .8 1.25 2.

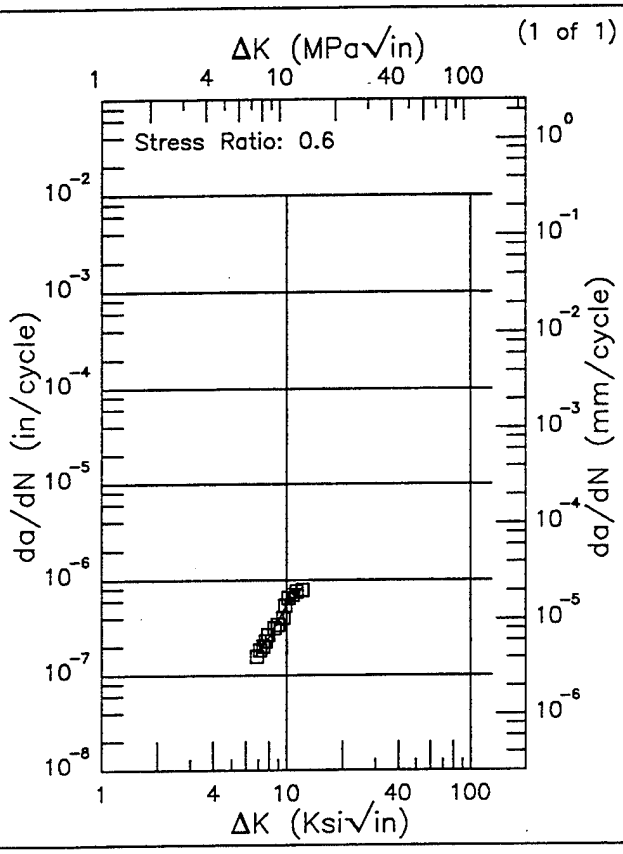
RMS % Error	Life Prediction Ratio Summary
1.47	0. .5 .8 1.25 2.

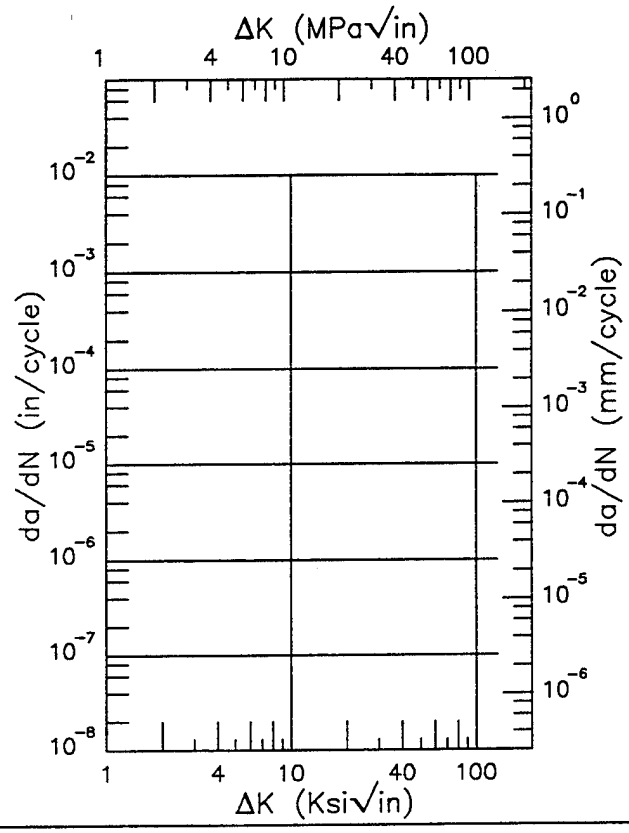
Figure 5.7.3.1.1

INCONEL 600 R

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Frequency: 6.7 Hz
Environment: LAB AIR;800°F

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.413 in.
Specimen Width: 2.002 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.90 (min)	0.172
7.	0.176
8.	0.250
9.	0.379
10.	0.547
12.06 (max)	0.818

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.46	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

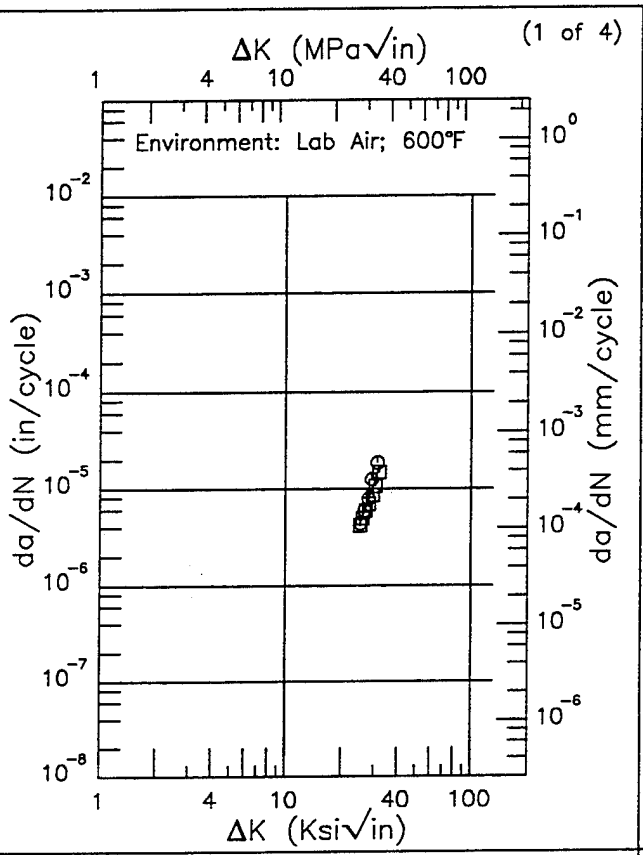
Figure 5.7.3.1.2

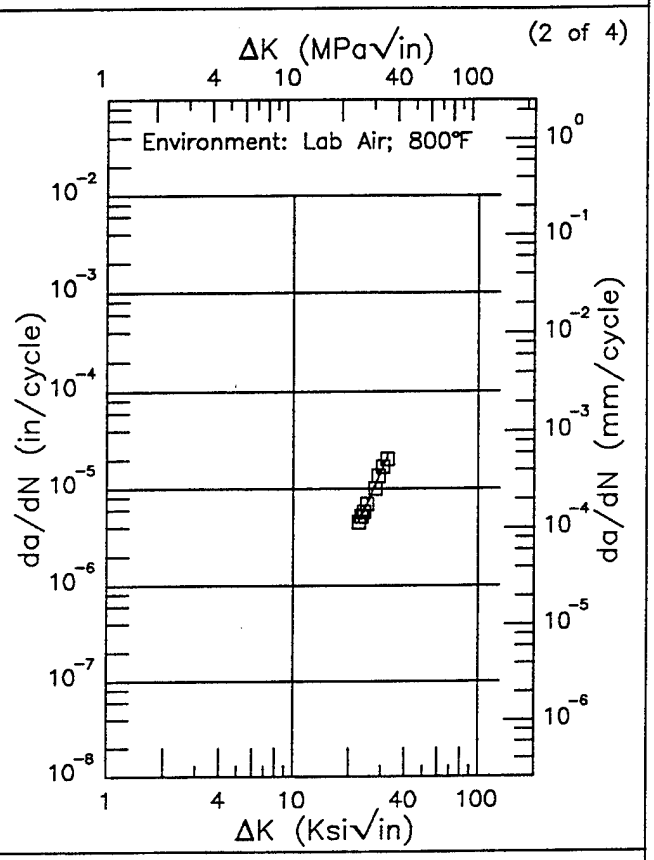
INCONEL 600

E

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.396 – 0.482 in.
Specimen Width: 1.997 – 2.005 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.08 (min)	4.25
30.	11.5
31.85 (max)	17.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
22.56 (min)	4.60
25.	6.72
30.	15.2
32.19 (max)	20.8

RMS % Error	Life Prediction Ratio Summary
14.42	0. .5 .8 1.25 2.

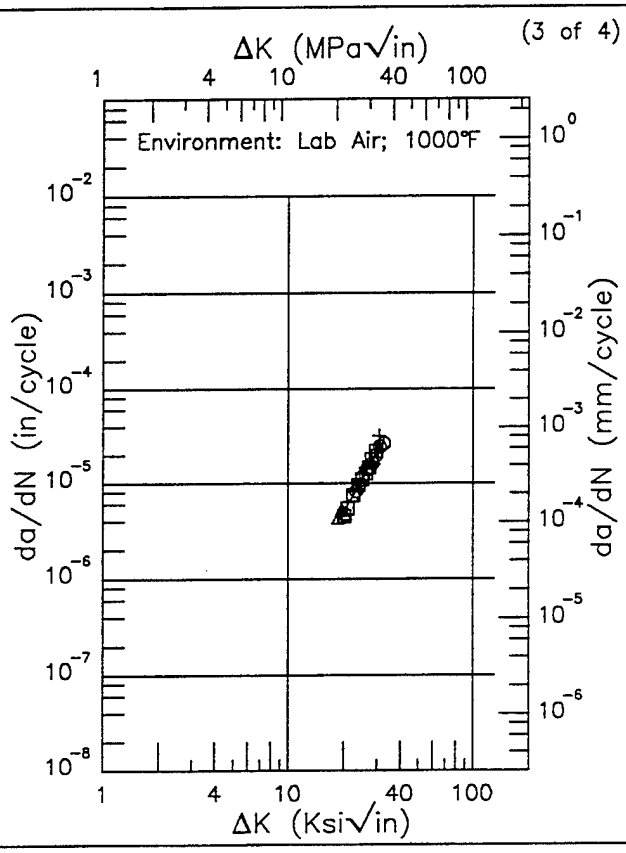
RMS % Error	Life Prediction Ratio Summary
4.10	0. .5 .8 1.25 2.

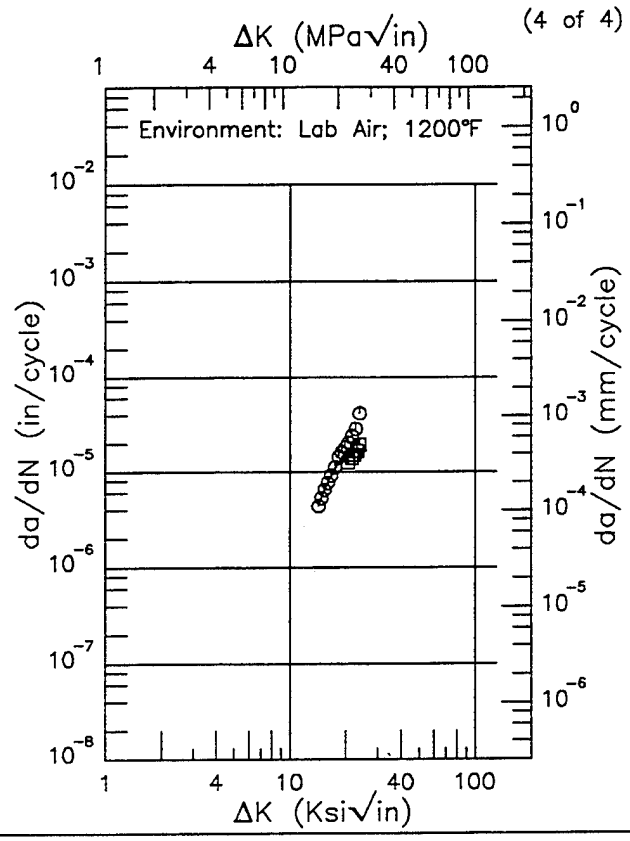
Figure 5.7.3.1.3

INCONEL 600 E

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.396 – 0.482 in.
Specimen Width: 1.997 – 2.005 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.57 (min)	4.34
20.	5.04
25.	11.0
30.	22.0
32.64 (max)	28.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.24 (min)	4.53
16.	7.58
20.	16.7
23.73 (max)	21.2

RMS % Error	Life Prediction Ratio Summary
8.71	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
28.60	0. .5 .8 1.25 2.

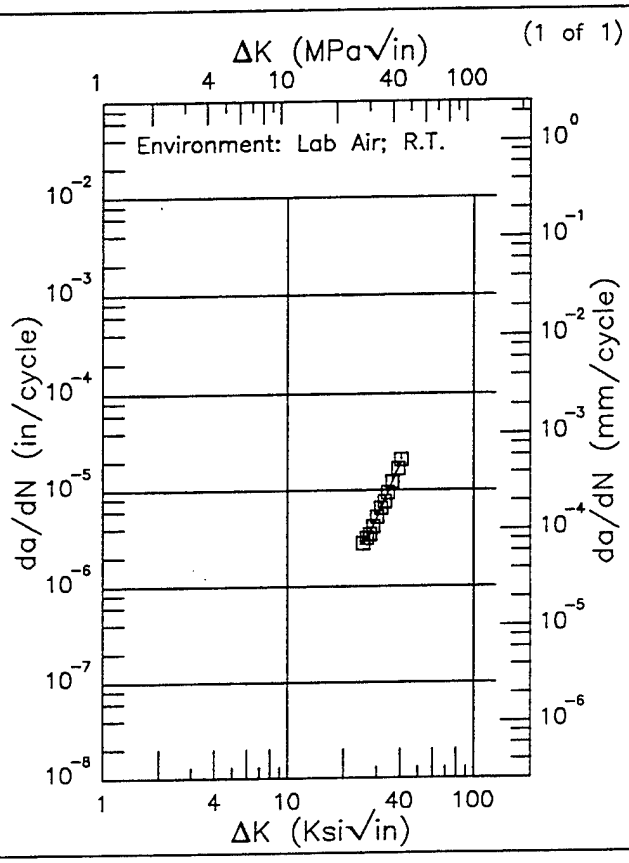
Figure 5.7.3.1.3 (Concluded)

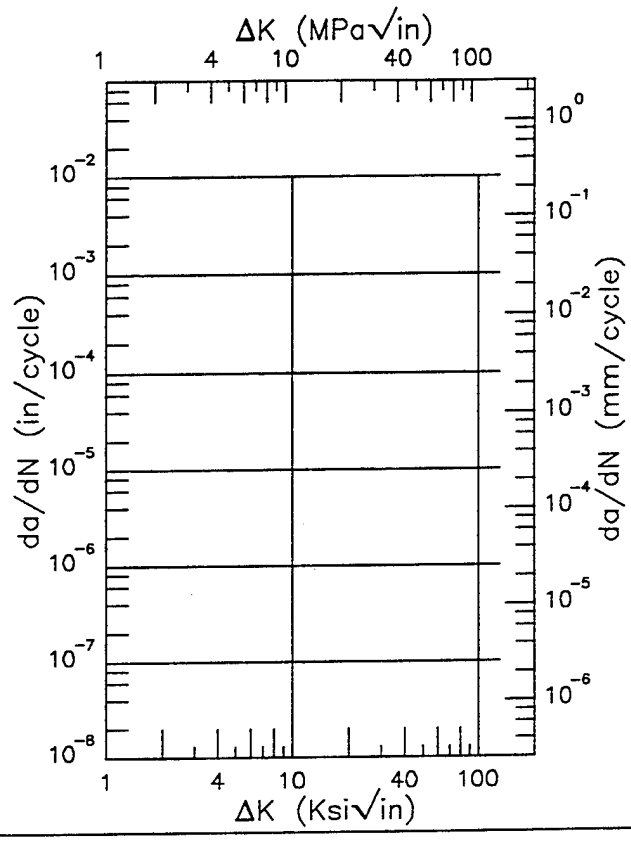
INCONEL 600

E

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 5 Hz

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.39 in.
Specimen Width: 2 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.33 (min)	2.73
30.	5.03
35.	10.3
40.	18.7
40.56 (max)	19.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
3.56	0. .5 .8 1.25 2.

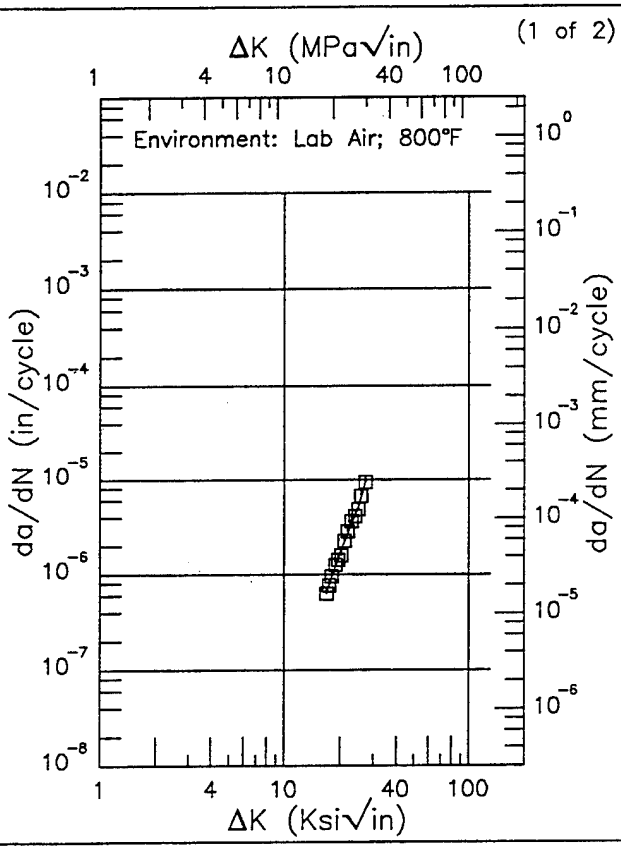
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

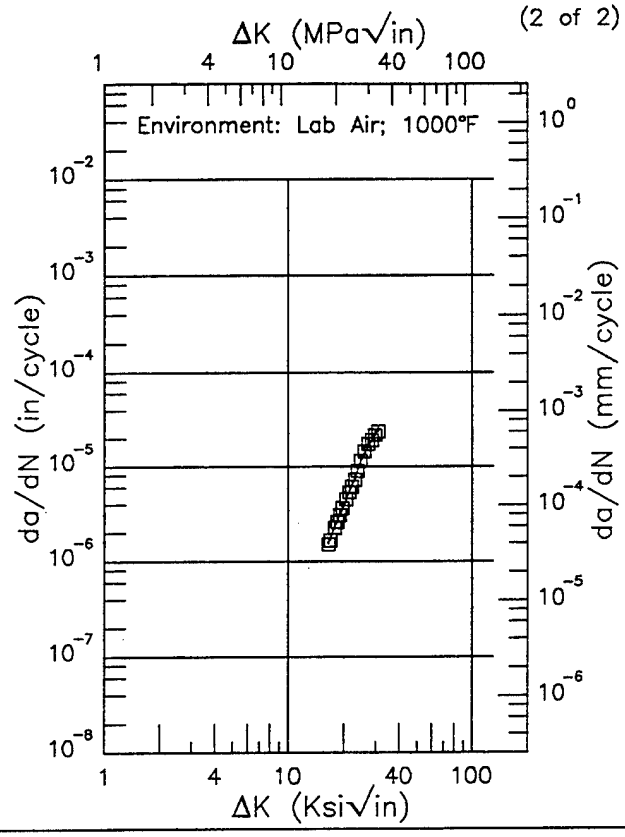
Figure 5.7.3.1.4

INCONEL 600 E

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 6.7 Hz

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.412 – 0.414 in.
Specimen Width: 2.002 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.89 (min)	0.660
20.	1.71
25.	5.27
27.20 (max)	9.39

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.50 (min)	1.55
20.	3.85
25.	11.8
30.	22.9
30.56 (max)	23.9

RMS % Error	Life Prediction Ratio Summary
5.32	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
3.90	0. .5 .8 1.25 2.

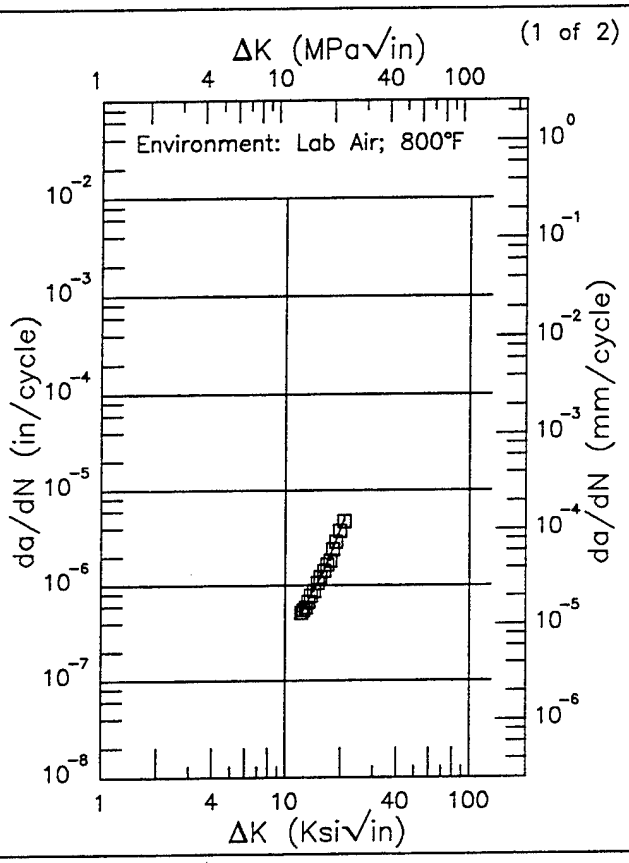
Figure 5.7.3.1.5

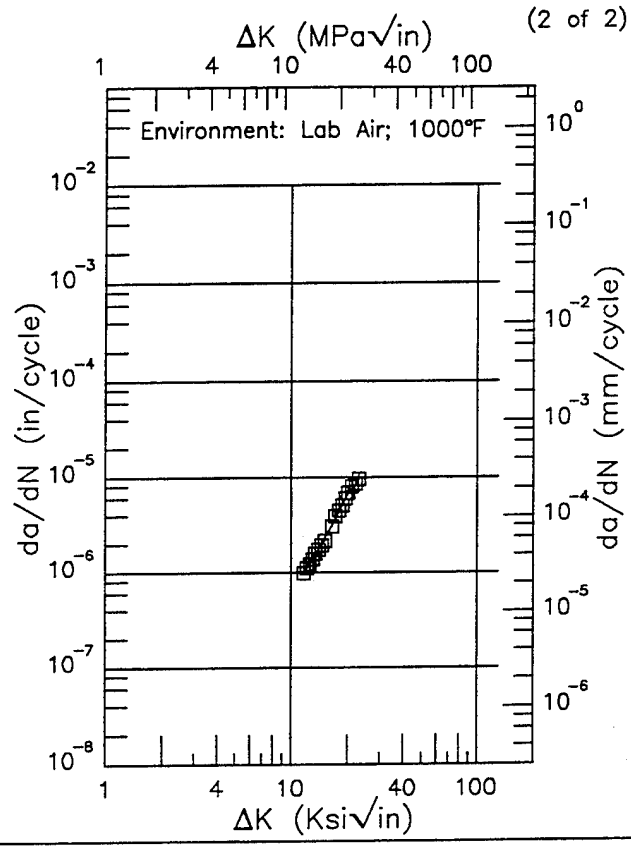
INCONEL 600

E

Condition/Ht: 1585F .75HR AC
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.33
Frequency: 6.7 Hz

Yield Strength: 35 ksi
Ult. Strength: 94.3 ksi
Specimen Thk: 0.413 in.
Specimen Width: 2.002 – 2.003 in.
Ref: HD003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.17 (min)	0.482
13.	0.627
16.	1.34
20.	3.92
20.75 (max)	4.77

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.70 (min)	0.989
13.	1.34
16.	2.75
20.	6.69
22.90 (max)	9.16

RMS % Error	Life Prediction Ratio Summary
4.09	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
3.06	0. .5 .8 1.25 2.

Figure 5.7.3.1.6

TABLE 5.8.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 625 AT ROOM TEMPERATURE

ORIENTATION: Unspecified **ENVIRONMENT: Lab Air**

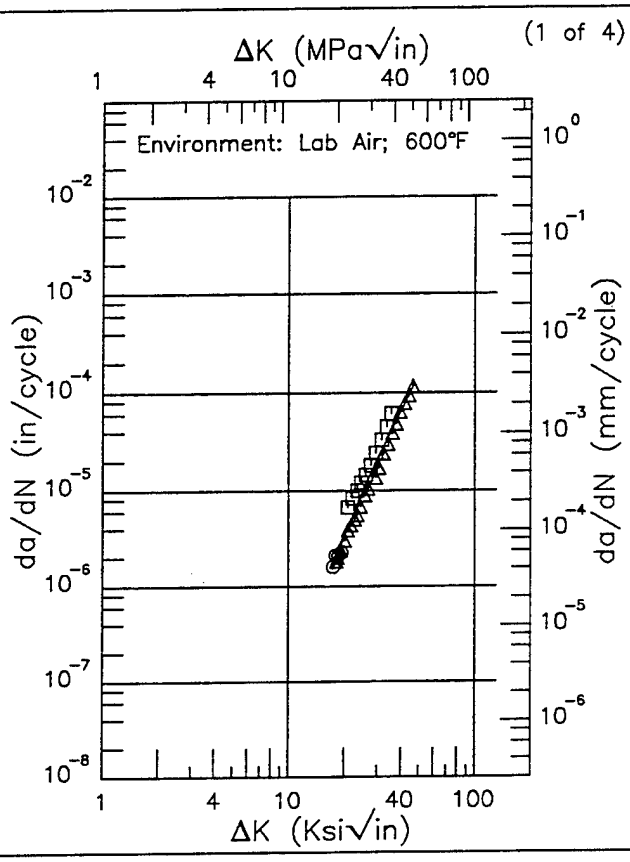
CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				Δ*K Level* (*Ksi√in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA	PLATE	0.05	10				2.07		

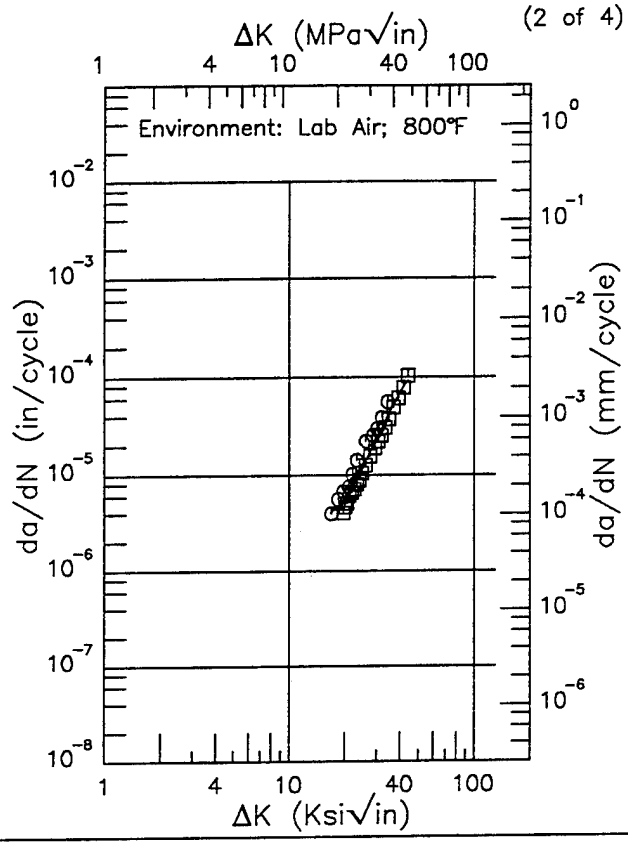
INCONEL 625

E

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 65.9 ksi
Ult. Strength: 132.9 ksi
Specimen Thk: 0.299 – 0.445 in.
Specimen Width: 1.153 – 2.002 in.
Ref: HD005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.31 (min)	1.51
20.	3.33
25.	9.73
30.	21.2
35.	39.0
40.	65.0
46.44 (max)	115.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.88 (min)	4.04
20.	5.70
25.	11.7
30.	23.7
35.	43.2
40.	69.1
44.02 (max)	92.1

RMS % Error	Life Prediction Ratio Summary
25.35	0. .5 .8 1.25 2.

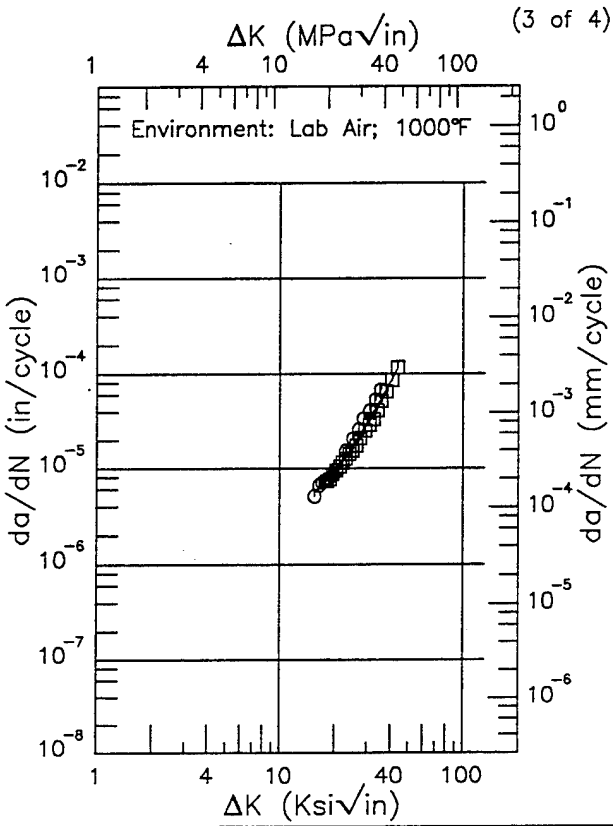
RMS % Error	Life Prediction Ratio Summary
22.59	0. .5 .8 1.25 2.

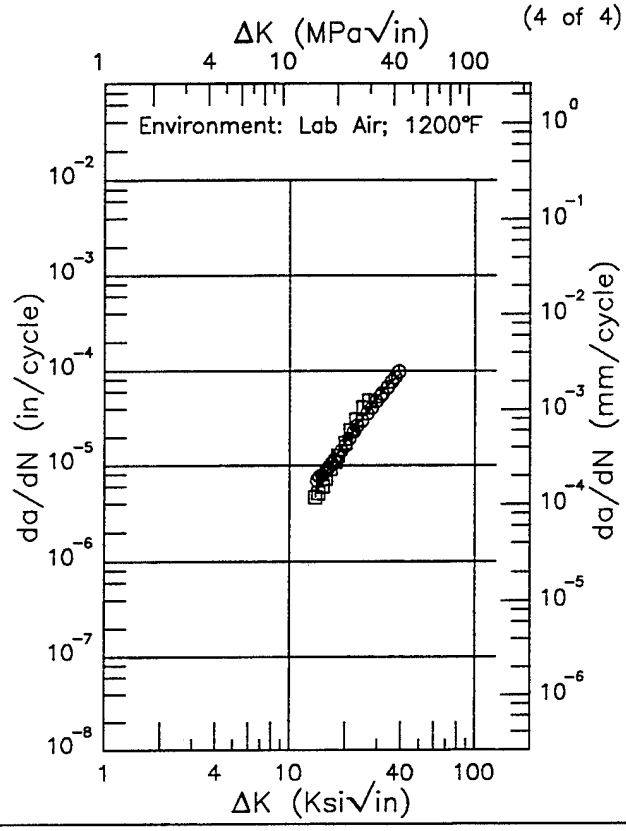
Figure 5.8.3.1.1

INCONEL 625 E

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 65.9 ksi
Ult. Strength: 132.9 ksi
Specimen Thk: 0.299 – 0.445 in.
Specimen Width: 1.153 – 2.002 in.
Ref: HD005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.46 (min)	5.62
16.	5.92
20.	9.27
25.	17.0
30.	30.4
35.	51.6
40.	82.9
43.39 (max)	111.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.75 (min)	5.39
16.	8.63
20.	17.1
25.	32.7
30.	52.5
35.	74.2
38.90 (max)	91.0

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
11.99	0. .5 .8 1.25 2.	10.79	0. .5 .8 1.25 2.

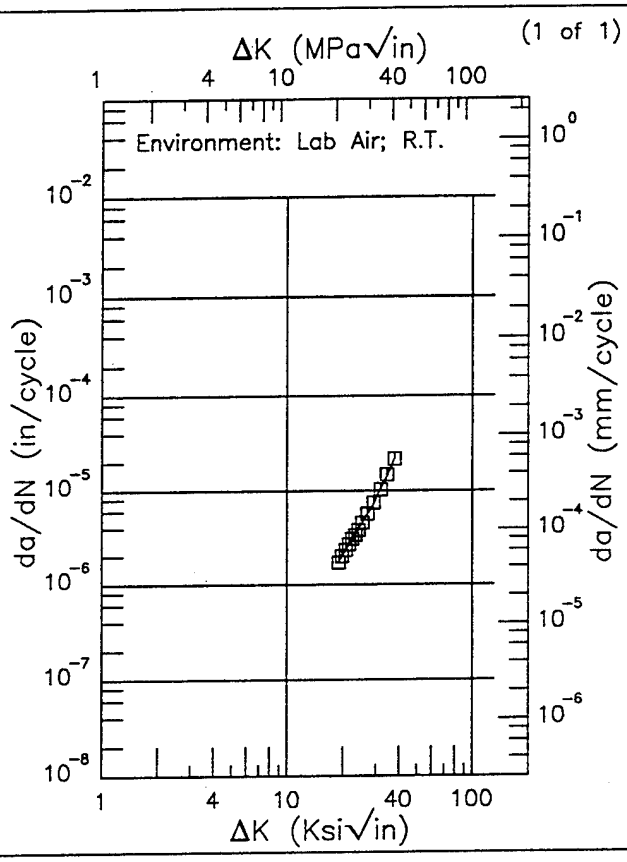
Figure 5.8.3.1.1 (Concluded)

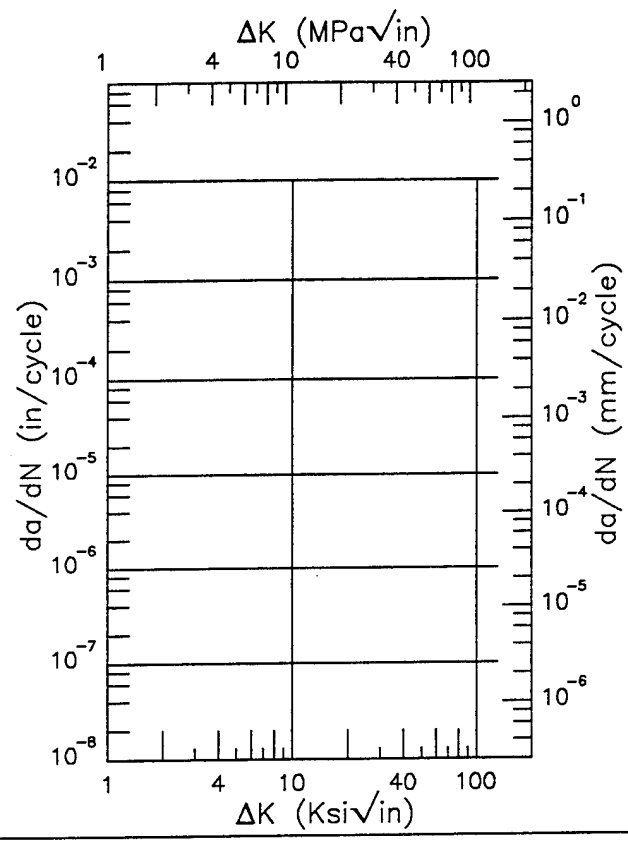
INCONEL 625

E

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 10 Hz

Yield Strength: 65.9 ksi
Ult. Strength: 132.9 ksi
Specimen Thk: 0.295 in.
Specimen Width: 1.153 in.
Ref: HD005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.93 (min)	1.71
20.	2.07
25.	4.35
30.	8.25
35.	15.4
37.87 (max)	22.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
1.70	0. .5 .8 1.25 2.

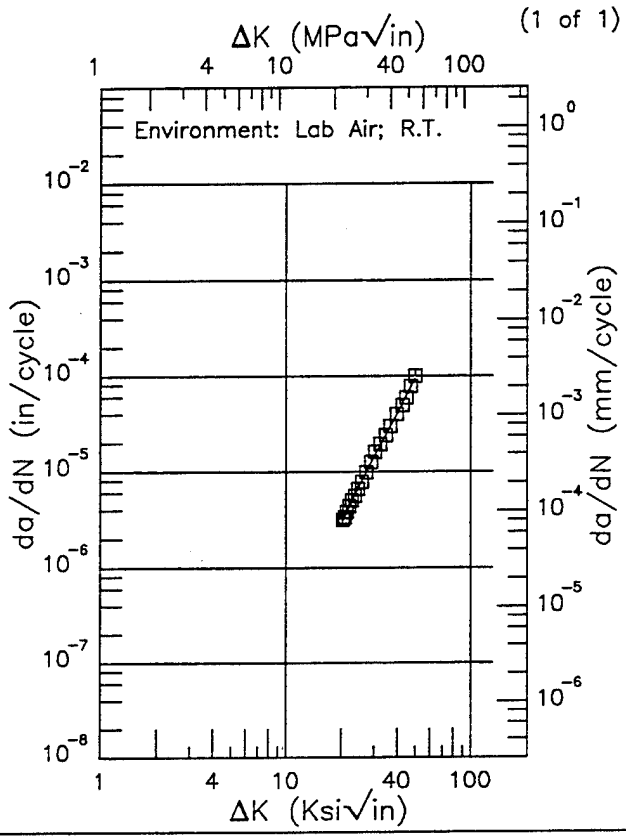
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

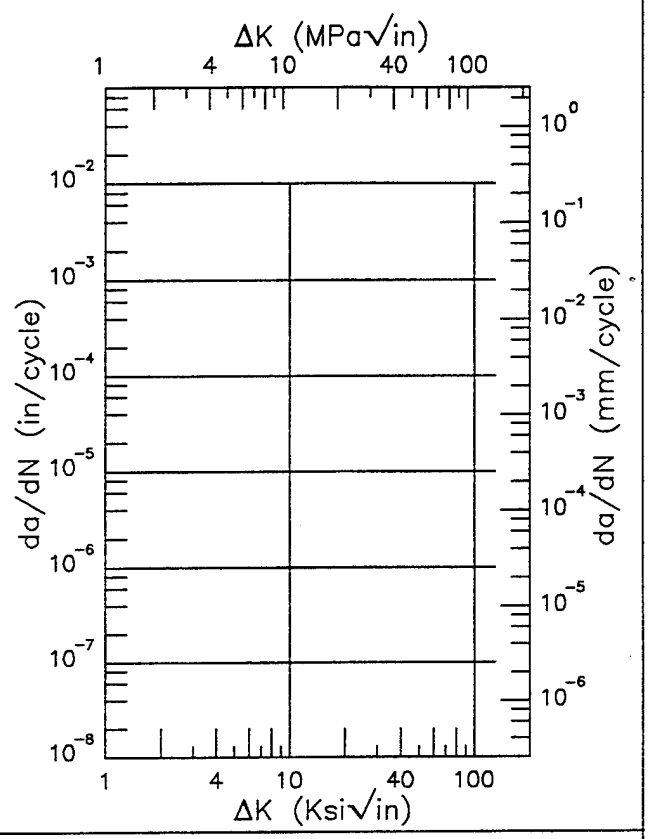
Figure 5.8.3.1.2

INCONEL 625 E

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 10 Hz

Yield Strength: 65.9 ksi
Ult. Strength: 132.9 ksi
Specimen Thk: 0.443 in.
Specimen Width: 2.002 in.
Ref: HD005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.25 (min)	3.01
25.	7.20
30.	14.3
35.	25.1
40.	40.8
49.76 (max)	94.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 3.26

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 5.8.3.1.3

TABLE 5.9.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR NICKEL BASE ALLOY INCONEL 718 AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Forging	STA	118.5	0.7	2	107.9	14.	2	---	---	---

TABLE 5.9.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*) ΔK *Level* (*Ksi/in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
STA	FORGING	0.1	1				2	73.61	

TABLE 5.9.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: L.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1325F 8HRS FC TO 1150F	FORGING	0.08	6				1.13	19.35	
		0.5	6				2.17	33.96	
ST 1850F 1360 F 9HRS F/C 1175F	FORGED BAR	0.08	6					10.16	
		0.5	6				1.16	33.41	

TABLE 5.9.1.2.3

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1750F AC 1325F	PLATE	0.05	8.33				1.28	30.57	
1950F AC 1325F	PLATE	0.05	8.33				1.05		
ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HOUR TO 1150F, 1150F 8HR, AC	PLATE	-0.2	10				1.14		
		0.02	4				0.92	16.4	
		0.02	20				1.75		
		0.5	10				2.97		
STA	FORGING	0.1	15-20				2.45	57.53	
		0.4	20				3.42		
		0.8	20-30			0.47			
UNSPECIFIED	UNSPECIFIED	0.1	10			0.13	2.46	56.78	

TABLE 5.9.1.2.4

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ST 1850F 1360 F 9HRS F/C 1175F	FORGED BAR	0.08	1					11.87	

TABLE 5.9.1.2.5

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Vacuum**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HOUR TO 1150F, 1150F 8HR, AC	PLATE	0.1	10				1.02	25.74	

TABLE 5.9.1.2.6

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
STA	FORGING	0.1	1				2.3	127.2	
		0.8	1			0.83			

TABLE 5.9.1.2.7

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: L.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi/in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1325F 8HRS FC TO 1150F	FORGING	0.08	6					30.86	
ST 1850F 1360 F 9HRS F/C 1175F	FORGED BAR	0.08	6					16.09	

TABLE 5.9.1.2.8

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1750F 1HR AC 1325F	FORGED BAR	0.05	8.33-10				3.08	116.49	
STA	FORGING	-1	5				0.69	29.84	
		0.1	15-20				2.19	83.07	
		0.4	20				3.16		
		0.8	20-30			0.47			

TABLE 5.9.1.2.9

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.C.S.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ST 1850F 1360 F 9HRS F/C 1175F	FORGED BAR	0.08	1					10.23	

TABLE 5.9.1.2.10

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ST 1850F 1360 F 9HRS F/C 1175F	FORGED BAR	0.08	1					8.23	

TABLE 5.9.1.2.11

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: S-L **ENVIRONMENT: L.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ST 1850F 1360 F 9HRS F/C 1175F	FORGED BAR	0.08	6					26.94	

TABLE 5.9.1.2.12

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi√in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
1750F AC 1325F	FORGED BAR	0.05	10				2.56	43.72	
1760F 1HR WQ 1325F 8HRS	DISK	0.	0.33				3.39		

TABLE 5.9.1.2.13

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK INCONEL 718 AT ROOM TEMPERATURE

ORIENTATION: Unspecified **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*) ΔK *Level* (*Ksi√in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
1750F 1HR AC 1325F	PLATE	0.05	10				1.65		
1750F AC 1325F	SHEET	0.05	5				1.95		
	FORGING	0.05	10				1.93	40.69	

TABLE 5.9.2.1

INCONEL 718 K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1325F 8 HR FC TO 1150F HOLD 18 HR	Forging	3.00	R.T.	T-L	160.0	4.022	1.120	CT	1.987	0.53	74.00	---	---	1973	88187
1325F 9 HR FC TO 1150F AT 100F/HR HOLD AT 1150F 8 HR AC	Forging	3.30	R.T.	T-L	151.0	2.002	0.746	CT	1.049	0.68	78.80	---	---	1973	88187
1325F 9 HR FC TO 1150F AT 100F/HR HOLD AT 1150F 8 HR AC	Forging	3.30	R.T.	S-L	143.0	2.002	0.749	CT	1.060	0.53	65.60	---	---	1973	88187
ST-CW-A	Round Bar	1.39	0	L-R	210.0	1.202	0.600	NB	0.573	0.15	51.80	52.6	1.1	1991	NH006
		1.39			210.0	1.202	0.599	NB	0.595	0.15	52.10			1991	NH006
		1.39			210.0	1.202	0.600	NB	0.597	0.16	53.90			1991	NH006
STA	Forging	3.00	-65	L-T	168.6	3.006	1.498	CT	1.576	1.33	122.80	102.8	28.4	1987	DA007
		1.50			181.1	3.014	1.500	CT	1.625	0.52	82.70			1987	DA006
STA	Forging	3.00	-65	T-L	172.4	3.006	1.495	CT	1.656	1.03	110.90	---	---	1987	DA007
STA	Forging	3.00	R.T.	L-T	161.2	3.007	1.499	CT	1.567	1.34	118.00	118.5	0.7	1987	DA007
		3.00			161.2	3.008	1.516	CT	1.531	1.36	119.00			1987	DA007
STA	Forging	3.00	R.T.	T-L	155.4	3.005	1.497	CT	1.601	1.44	117.80	107.9	14.0	1987	DA007
		3.00			155.4	3.006	1.500	CT	1.593	0.99	98.00			1987	DA007
STA	Round Bar	1.39	0	L-R	179.0	1.199	0.599	NB	0.737	0.47	77.30	81.1	3.4	1991	NH006
		1.39			179.0	1.201	0.600	NB	0.628	0.49	79.40			1991	NH006
		1.39			179.0	1.199	0.599	NB	0.615	0.54	82.90			1991	NH006
		1.39			179.0	1.200	0.600	NB	0.619	0.56	84.90			1991	NH006

TABLE 5.9.2.2

INCONEL 718 K_C

CONDITIONHE AT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} (K_{si} * $\sqrt{in.}$)	K_{app} MEAN	K_{app} STAN DEV	K_C (K_{si} * $\sqrt{in.}$)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES NOT RESTRAINED																			
Cold Rolled 30 Percent and Aged	Sheet	0.03	-423	L-T	269.0	4.010	0.027	1.270	1.450	---	116.00	174.77	175.8	5.7	190.67	191.1	7.5	1964	60578
		0.03			269.0	4.010	0.027	1.240	1.370	---	117.00	173.64			185.14			1964	60578
		0.03			269.0	4.010	0.027	1.250	1.400	---	120.00	178.99			192.64			1964	60578
		0.03			269.0	4.010	0.027	1.270	1.400	---	119.00	179.29			191.03			1964	60578
		0.03			269.0	4.020	0.027	1.750	2.050	---	92.50	174.19			198.97			1964	60578
		0.03			269.0	4.000	0.028	1.310	1.340	---	116.00	178.34			180.98			1964	60578
		0.03			269.0	4.000	0.028	1.280	1.420	---	117.00	177.22			189.70			1964	60578
		0.03			269.0	4.000	0.028	1.370	1.480	---	112.00	177.30			186.79			1964	60578
		0.03			269.0	4.000	0.028	1.740	2.000	---	90.50	169.90			190.76			1964	60578
		0.03			269.0	4.010	0.028	1.240	1.500	---	119.00	176.61			200.22			1964	60578
		0.03			269.0	4.010	0.028	1.740	2.000	---	87.50	164.15			184.25			1964	60578
		0.03			269.0	4.010	0.028	0.750	0.890	---	168.00	186.38			204.90*			1964	60578
		0.03			269.0	4.010	0.028	1.250	1.400	---	118.00	176.01			189.43			1964	60578
		0.03			269.0	4.010	0.028	0.740	0.950	---	169.00	186.13			213.90*			1964	60578
		0.03			269.0	4.010	0.028	1.770	2.050	---	91.50	173.97			197.02			1964	60578
		0.03			269.0	4.010	0.028	0.750	1.020	---	158.00	175.29			208.37			1964	60578
		0.03			269.0	4.010	0.028	1.730	1.920	---	89.00	166.22			180.87			1964	60578

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 5.9.2.2 (CONTINUED)

INCONEL 718 K_C

CONDITIONHE AT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} (K_{app} (Ksi • √in.))	K_{app} MEAN	K_{app} STAN DEV	K_C (K_C (Ksi • √in.))	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES NOT RESTRAINED																			
Cold Rolled 30 Percent and Aged	Sheet	0.03	-320	L-T	259.0	4.000	0.027	1.310	1.620	---	123.00	189.10	180.4	8.8	218.77	200.6	13.8	1964	60578
		0.03			259.0	4.010	0.027	1.250	1.400	---	126.00	187.94			202.27			1964	60578
		0.03			259.0	3.980	0.028	1.330	1.550	---	119.00	184.90			205.22			1964	60578
		0.03			259.0	4.000	0.028	0.730	0.930	---	169.00	184.78			211.35*			1964	60578
		0.03			259.0	4.000	0.028	1.270	1.650	---	121.00	182.37			218.16			1964	60578
		0.03			259.0	4.000	0.028	0.730	0.830	---	171.00	186.97*			200.60*			1964	60578
		0.03			259.0	4.000	0.028	1.290	1.650	---	118.00	179.63			212.75			1964	60578
		0.03			259.0	4.010	0.028	1.730	1.920	---	92.00	171.83			186.97			1964	60578
		0.03			259.0	4.010	0.028	1.300	1.750	---	125.00	191.16			235.55*			1964	60578
		0.03			259.0	4.010	0.028	1.250	1.450	---	119.00	177.50			195.61			1964	60578
		0.03			259.0	4.010	0.028	1.730	1.790	---	89.10	166.41			170.92			1964	60578
		0.03			259.0	4.010	0.028	1.720	2.000	---	90.30	167.90			190.15			1964	60578
		0.03			259.0	4.010	0.028	1.730	2.090	---	91.90	171.64			201.46			1964	60578
		0.03			259.0	4.010	0.028	0.740	0.950	---	177.00	194.94*			224.02*			1964	60578
		0.03			259.0	4.010	0.028	0.730	0.850	---	170.00	185.85*			202.06*			1964	60578
		0.03			259.0	4.010	0.028	1.230	1.400	---	127.00	187.53			203.87			1964	60578
		0.03			259.0	4.010	0.028	1.250	1.450	---	129.00	192.42			212.04			1964	60578
		0.03			259.0	4.010	0.028	1.720	1.950	---	91.90	170.88			189.27			1964	60578

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 5.9.2.2 (CONTINUED)

INCONEL 718 K_C

CONDITIONHE AT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} K_{app} (Ksi • √in.)	K_{app} K_{app} MEAN	K_{app} STAN DEV	K_C K_C (Ksi • √in.)	K_C K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES NOT RESTRAINED																			
Cold Rolled 30 Percent and Aged	Sheet	0.03	R.T.	L-T	218.0	4.020	0.026	1.310	1.700	---	114.00	175.14	161.4	8.6	209.94*	178.5	3.6	1964	60578
		0.03			218.0	4.010	0.027	1.280	1.500	---	118.00	178.68			198.54*			1964	60578
		0.03			218.0	4.000	0.028	1.730	1.980	---	83.00	155.12			173.40			1964	60578
		0.03			218.0	4.000	0.028	1.250	1.450	---	111.00	165.62			182.54			1964	60578
		0.03			218.0	4.000	0.028	1.250	1.550	---	112.00	167.12			192.94*			1964	60578
		0.03			218.0	4.000	0.028	1.720	2.100	---	81.80	152.20			180.32			1964	60578
		0.03			218.0	4.000	0.028	0.730	1.050	---	138.00	150.89			185.16*			1964	60578
		0.03			218.0	4.000	0.028	1.230	1.480	---	116.00	171.34			193.46*			1964	60578
		0.03			218.0	4.010	0.028	1.720	2.150	---	85.50	158.98			192.56*			1964	60578
		0.03			218.0	4.010	0.028	0.740	0.880	---	138.00	151.99			167.24*			1964	60578
		0.03			218.0	4.010	0.028	0.720	0.940	---	145.00	157.34*			182.41*			1964	60578
		0.03			218.0	4.010	0.028	1.240	1.460	---	110.00	163.25			181.66			1964	60578
		0.03			218.0	4.010	0.028	0.730	1.000	---	148.00	161.80*			192.94*			1964	60578
		0.03			218.0	4.010	0.028	1.720	1.950	---	85.80	159.53			176.70			1964	60578
		0.03			218.0	4.010	0.028	0.720	0.890	---	143.00	155.17			174.41*			1964	60578
		0.03			218.0	4.010	0.028	1.320	1.650	---	104.00	160.62			187.39*			1964	60578
		0.03			218.0	4.010	0.028	1.240	1.550	---	112.00	166.22			192.84*			1964	60578
		0.03			218.0	4.010	0.028	1.730	2.100	---	80.10	149.60			176.38			1964	60578
		0.03			218.0	4.020	0.028	1.270	1.730	---	108.00	162.67			201.57*			1964	60578

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 5.9.2.2 (CONCLUDED)

INCONEL 718 K_C																			
CONDITIONHE AT TREAT	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN		CRACK LENGTH		GROSS STRESS		K_{app}			K_C			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	INIT (in.) $2a_o$	FINAL (in.) $2a_f$	ONSET (Ksi) σ_o	MAX (Ksi) σ_{Max}	K_{app} (Ksi • $\sqrt{in.}$)	K_{app} MEAN	STAN DEV	K_C (Ksi • $\sqrt{in.}$)	K_C MEAN	STAN DEV		
BUCKLING OF CRACK EDGES NOT RESTRAINED																			
Cold Rolled 30 Percent and Aged	Sheet	0.03	R.T.	L-T	218.0	17.930	0.026	5.480	5.880	---	64.40	200.63	197.0	6.5	233.26	224.6	11.1	1964	60578
		0.03			218.0	17.930	0.026	5.480	5.880	---	64.30	200.31			209.48			1964	60578
		0.03			218.0	17.940	0.026	5.470	6.820	---	65.50	203.81			235.75			1964	60578
		0.03			218.0	18.080	0.026	5.480	6.680	---	61.30	190.77			217.14			1964	60578
		0.03			218.0	18.080	0.026	5.470	7.200	---	60.90	189.31			227.47			1964	60578

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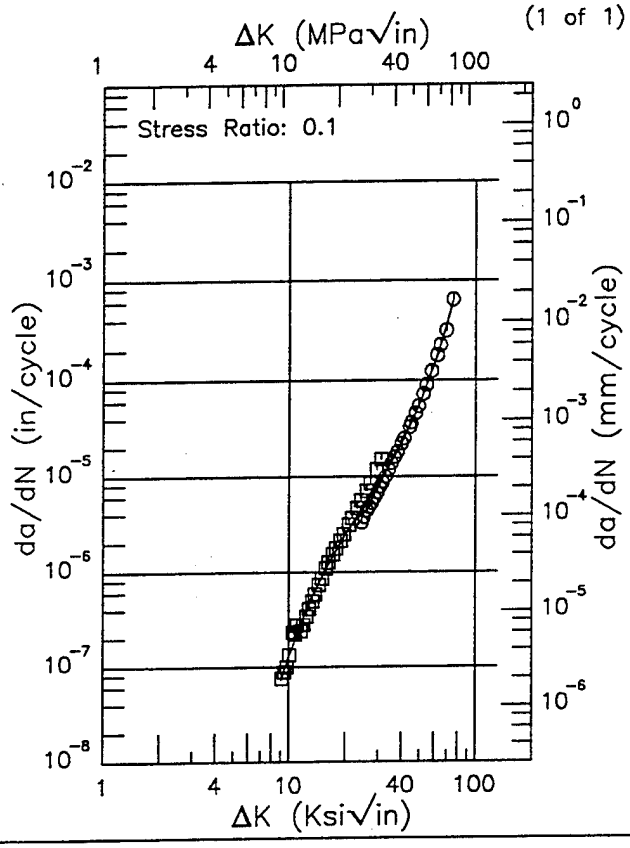
INCONEL 718

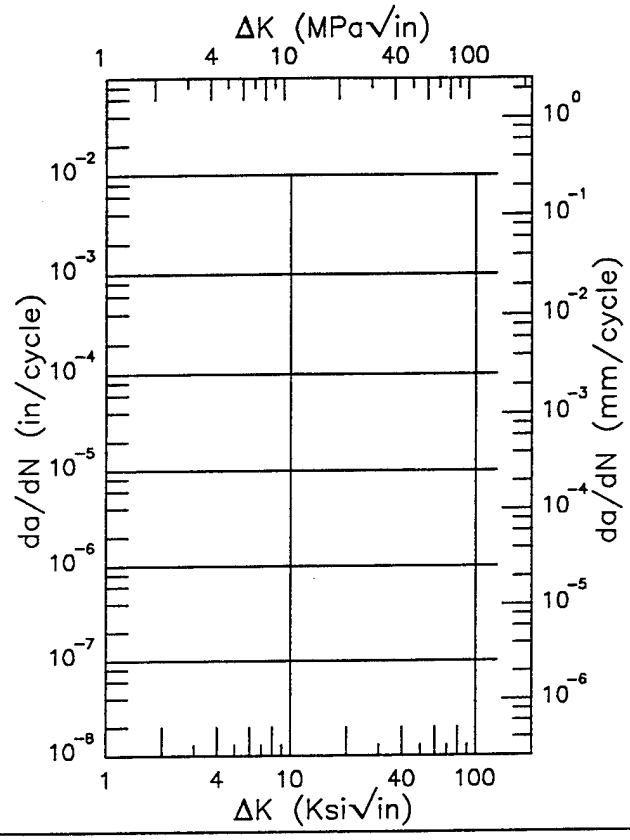
R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.25 in.
Specimen Width: 2 in.
Ref: NC005

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.10 (min)	0.0720
10.	0.129
13.	0.498
16.	1.15
20.	2.46
25.	4.86
30.	8.44
35.	13.9
40.	22.3
50.	56.8
60.	145.
70.	374.
75.14 (max)	612.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 17.15

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

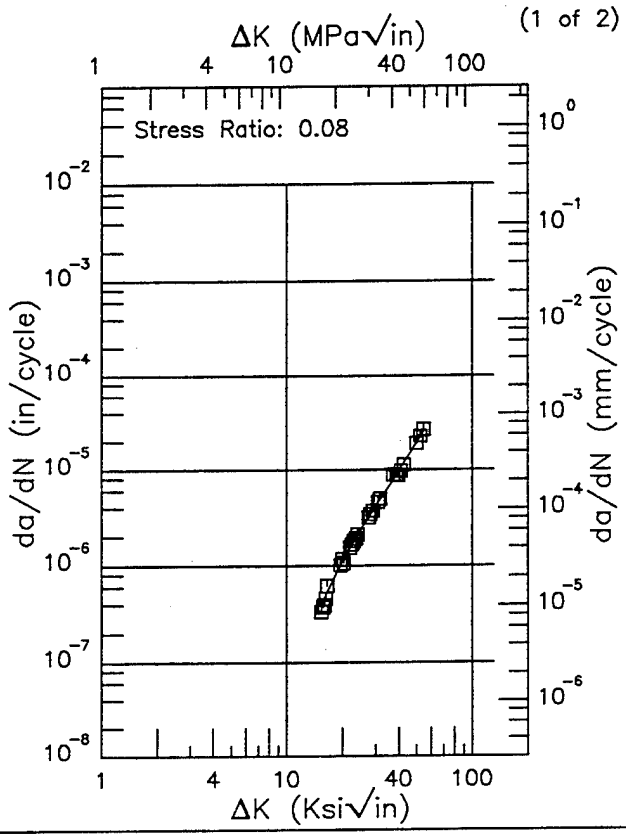
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

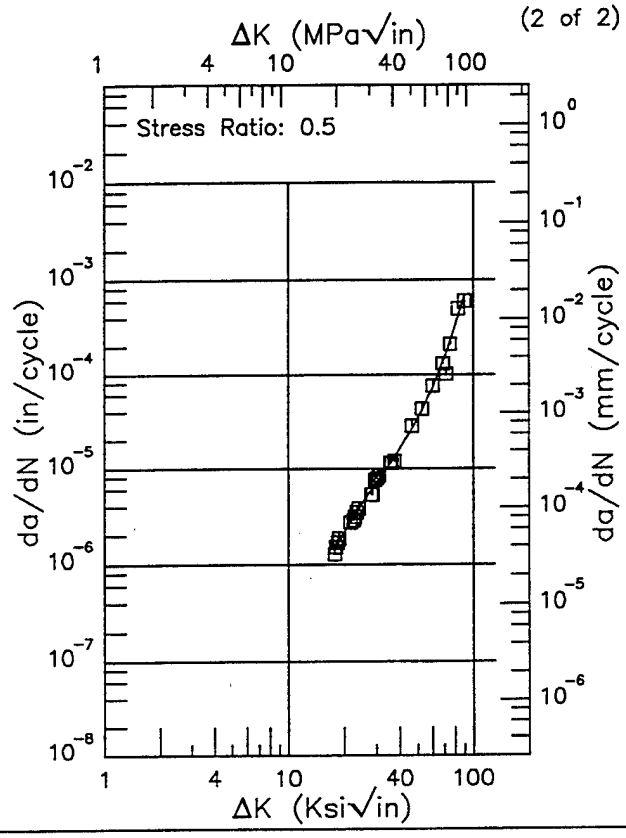
Figure 5.9.3.1.1

INCONEL 718 R

Condition/Ht: 1325F 8HRS FC TO 1150F
Form: 4 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: L.H.A.; RT

Yield Strength: 168 ksi
Ult. Strength: 199 ksi
Specimen Thk: 0.54 – 0.55 in.
Specimen Width: 7.4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.35 (min)	0.393
16.	0.470
20.	1.13
25.	2.38
30.	4.16
35.	6.54
40.	9.70
50.	19.3
54.42 (max)	25.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.63 (min)	1.40
20.	2.17
25.	4.27
30.	7.07
35.	10.9
40.	16.1
50.	34.0
60.	71.4
70.	152.
80.	329.
89.46 (max)	689.

RMS % Error	Life Prediction Ratio Summary
7.76	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
11.73	0. .5 .8 1.25 2.

Figure 5.9.3.1.2

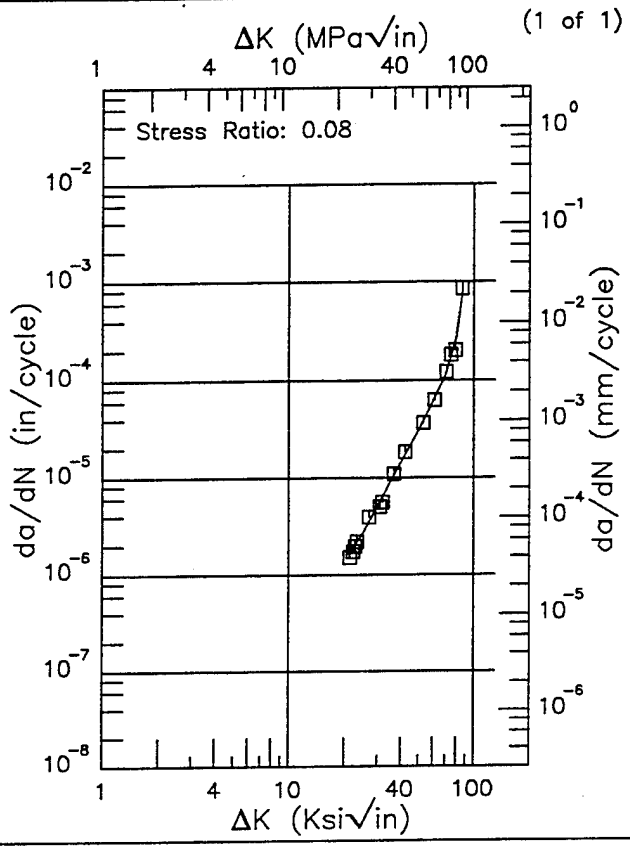
INCONEL 718

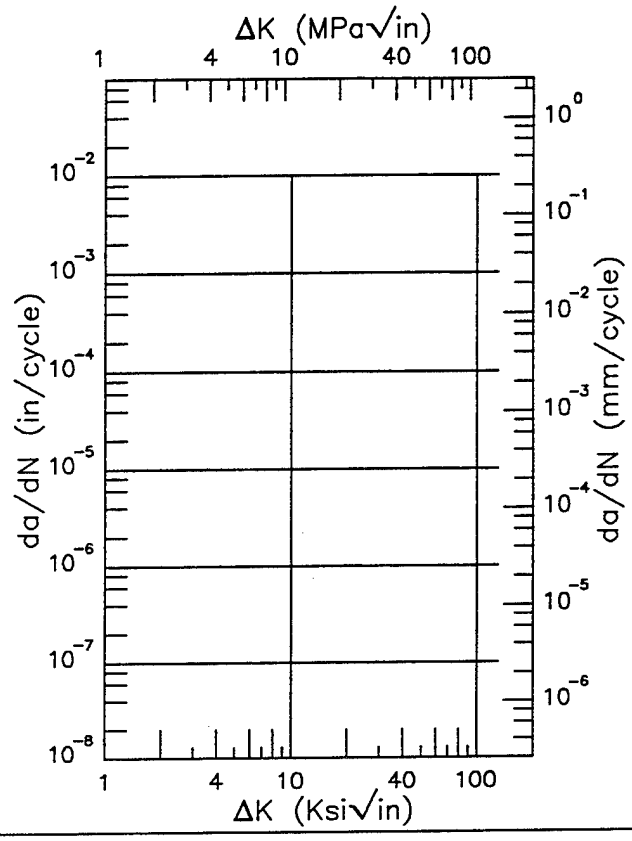
R

Condition/Ht: 1325F 8HRS FC TO 1150F
Form: 4 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 6 Hz
Environment: L.H.A.; RT

Yield Strength: 166 ksi
Ult. Strength: 197 ksi
Specimen Thk: 0.51 in.
Specimen Width: 6.01 in.
Ref: 88579

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.31 (min)	1.65
25.	2.68
30.	5.10
35.	8.98
40.	14.4
50.	30.9
60.	60.4
70.	113.
80.	265.
86.24 (max)	822.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
8.08	0. .5 .8 1.25 2.

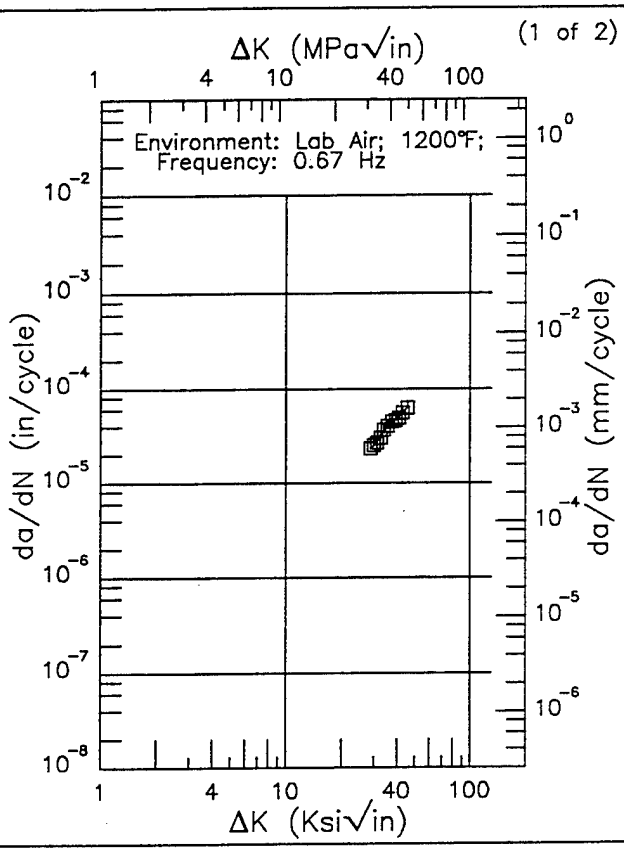
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

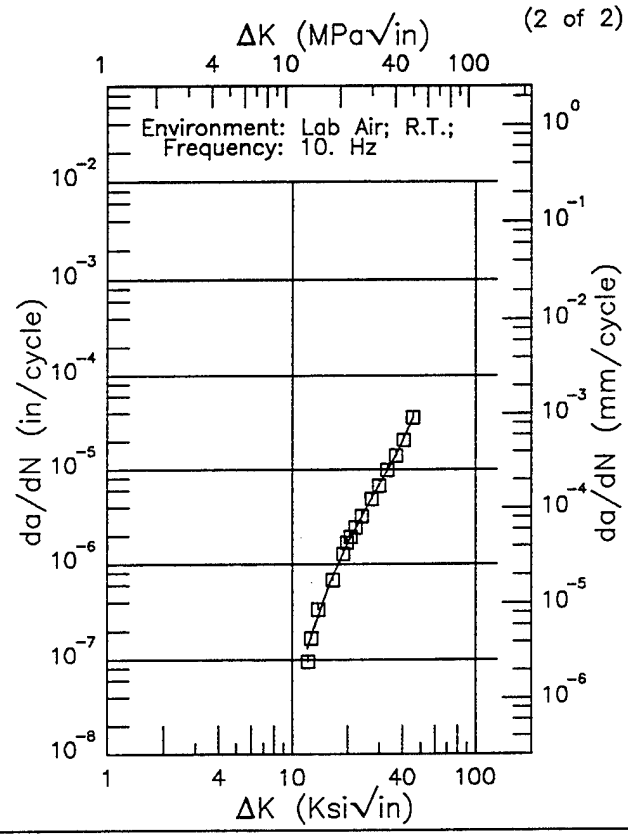
Figure 5.9.3.1.3

INCONEL 718 EF

Condition/Ht: 1750F 1HR AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05

Yield Strength: 147.9 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.298 – 0.49 in.
Specimen Width: 1.153 – 1.998 in.
Ref: HD016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
28.72 (min)	22.8
30.	24.7
35.	38.5
40.	48.4
45.46 (max)	63.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.11 (min)	0.132
13.	0.207
16.	0.633
20.	1.65
25.	3.69
30.	6.88
35.	11.9
40.	20.0
45.38 (max)	34.7

RMS % Error	Life Prediction Ratio Summary
2.74	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.80	0. .5 .8 1.25 2.

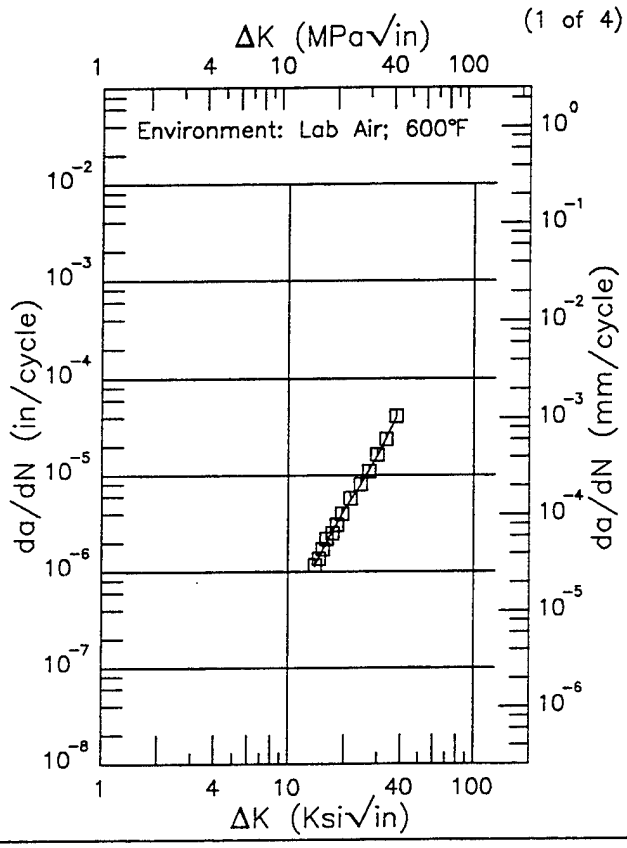
Figure 5.9.3.1.4

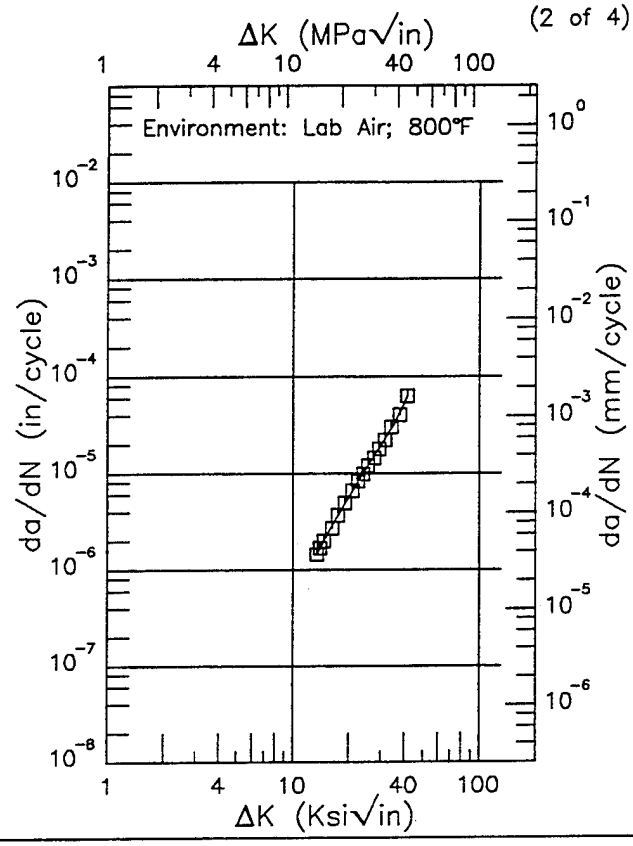
INCONEL 718

E

Condition/Ht: 1750F 1HR AC 1325F
Form: 0.63 in. Forged Bar
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 164.9 ksi
Ult. Strength: 208.1 ksi
Specimen Thk: 0.3 – 0.302 in.
Specimen Width: 1.152 – 1.153 in.
Ref: HD016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.90 (min)	1.13
16.	2.00
20.	4.34
25.	8.76
30.	16.0
35.	28.9
37.80 (max)	40.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.42 (min)	1.42
16.	2.66
20.	5.67
25.	11.3
30.	19.2
35.	31.7
40.	53.7
41.21 (max)	61.6

RMS % Error	Life Prediction Ratio Summary
3.21	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
2.22	0. .5 .8 1.25 2.

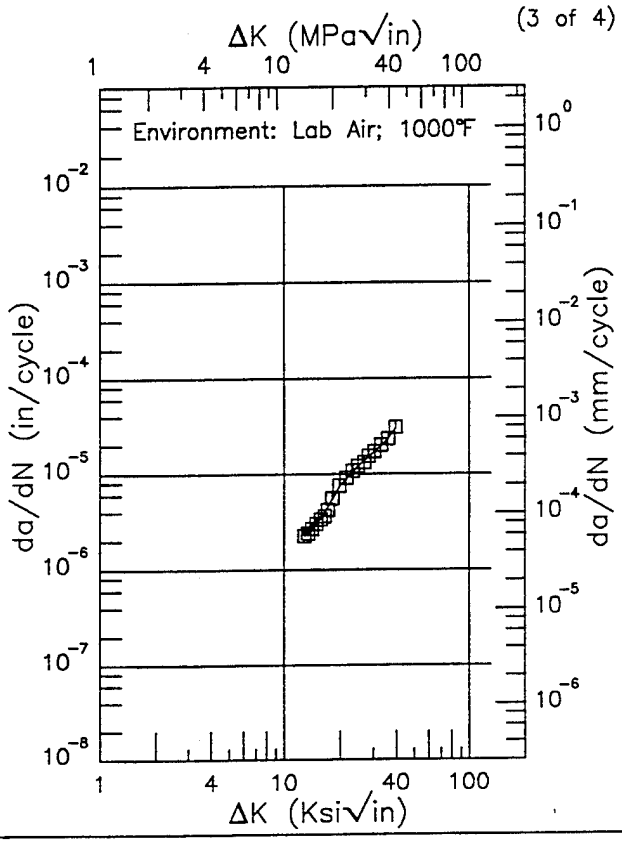
Figure 5.9.3.1.5

INCONEL 718 E

Condition/Ht: 1750F 1HR AC 1325F
Form: 0.63 in. Forged Bar
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 164.9 ksi
Ult. Strength: 208.1 ksi
Specimen Thk: 0.3 – 0.302 in.
Specimen Width: 1.152 – 1.153 in.
Ref: HD016

(3 of 4)

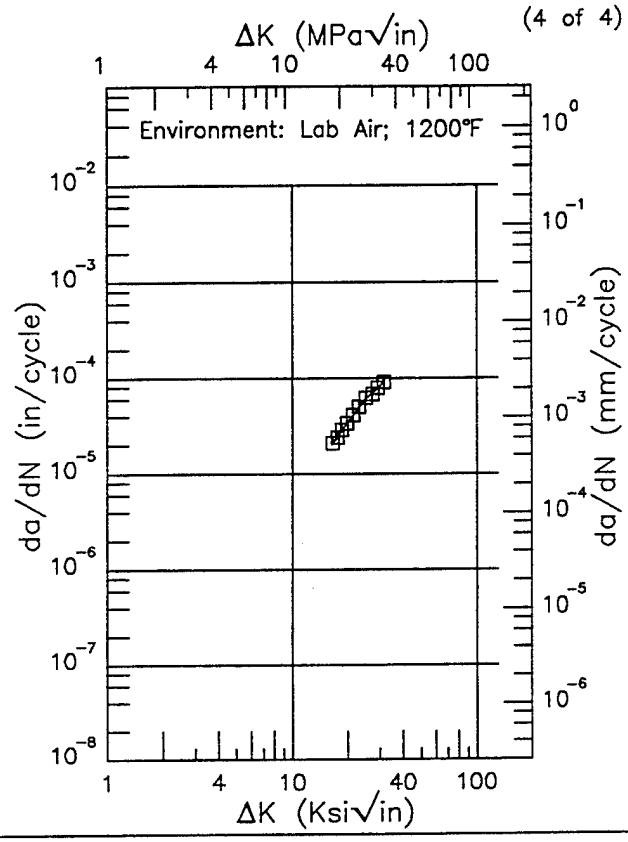


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.74 (min)	2.35
13.	2.34
16.	3.56
20.	7.57
25.	12.1
30.	16.5
35.	21.6
39.66 (max)	30.3

RMS % Error: 3.54

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

(4 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.46 (min)	20.4
20.	34.4
25.	60.1
30.	82.4
31.33 (max)	91.2

RMS % Error: 1.74

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 5.9.3.1.5 (Concluded)

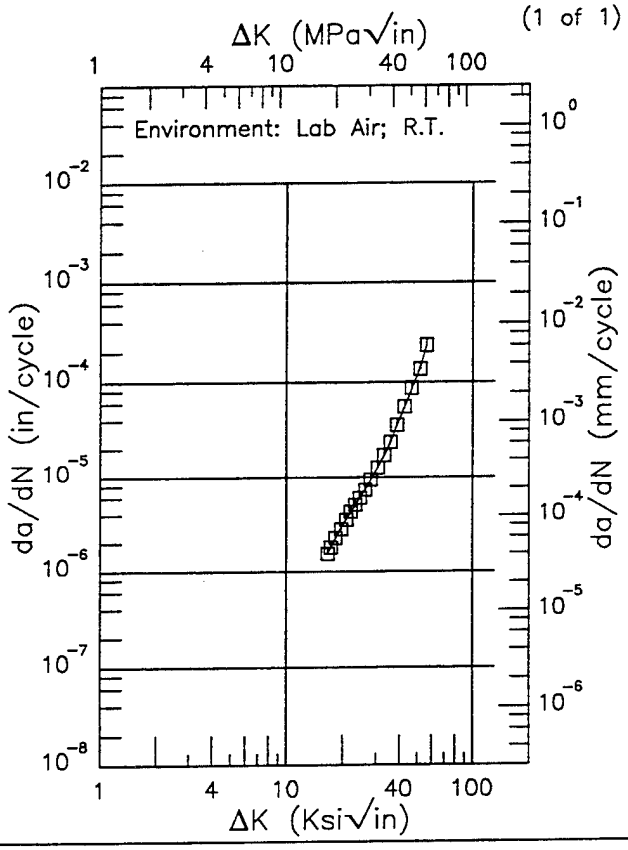
INCONEL 718

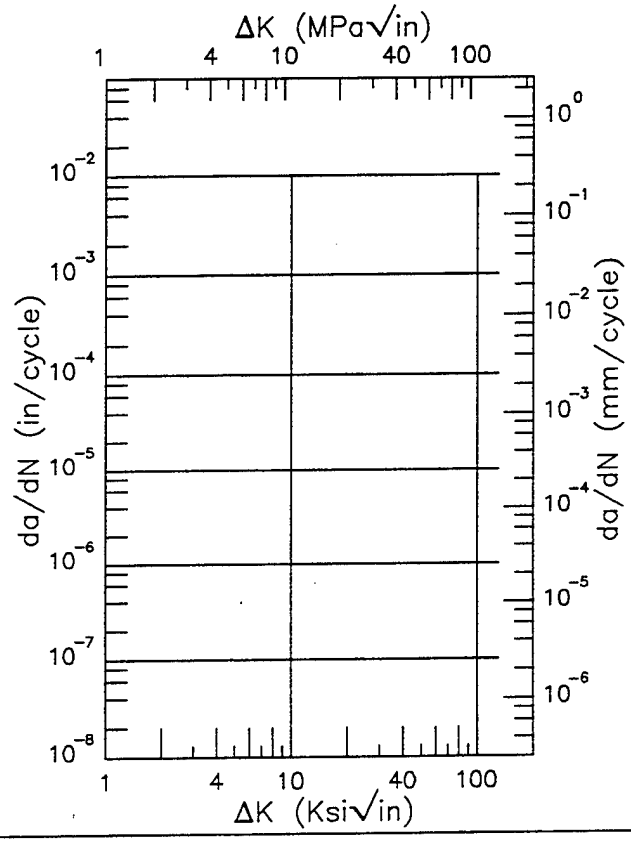
E

Condition/Ht: 1750F 1HR AC 1325F
Form: 0.63 in. Forged Bar
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.05
Frequency: 8.3 – 10 Hz

Yield Strength: 164.9 ksi
Ult. Strength: 208.1 ksi
Specimen Thk: 0.301 in.
Specimen Width: 1.151 in.
Ref: HD016

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.56 (min)	1.53
20.	3.08
25.	6.32
30.	11.6
35.	21.6
40.	41.8
50.	116.
56.03 (max)	235.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.00	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

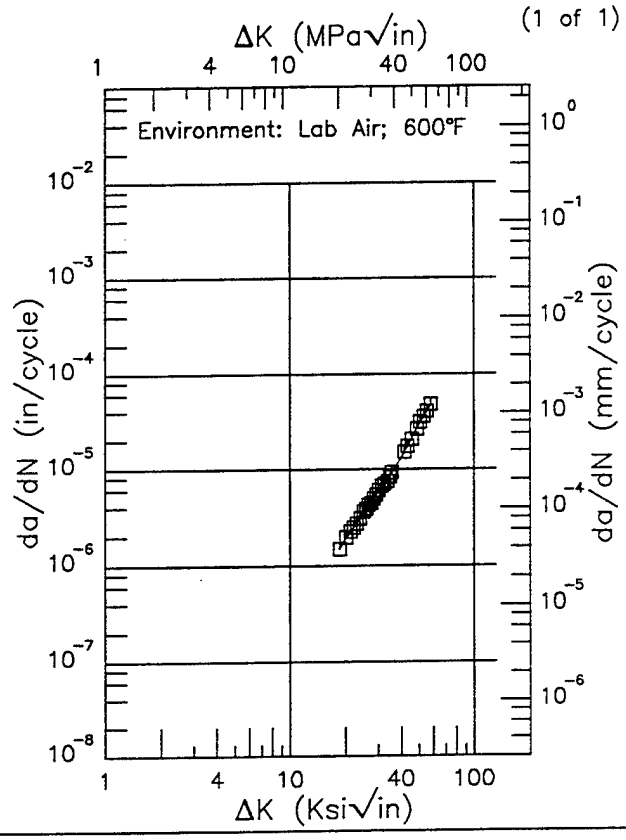
Figure 5.9.3.1.6

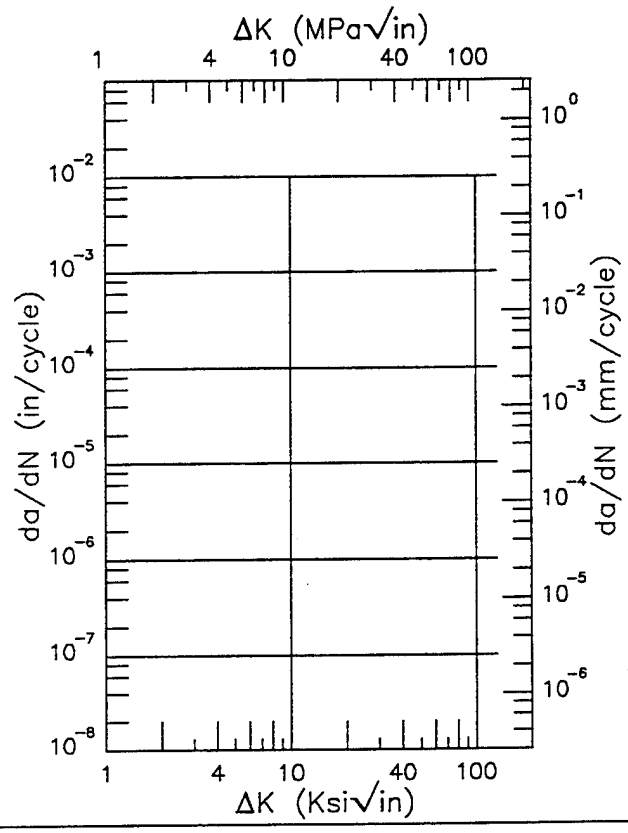
INCONEL 718 E

Condition/Ht: 1750F AC
Form: 0.06 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 174 ksi
Ult. Strength: 204.1 ksi
Specimen Thk: 0.061 in.
Specimen Width: 1.995 in.
Ref: HD017

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.40 (min)	1.50
20.	1.90
25.	3.53
30.	5.73
35.	8.69
40.	13.1
50.	29.2
57.54 (max)	46.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.11	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

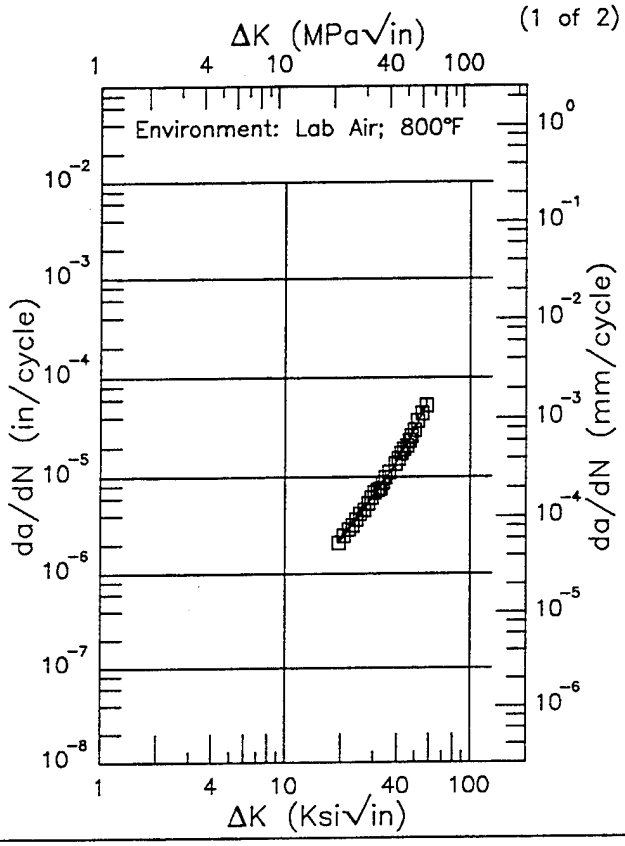
Figure 5.9.3.1.7

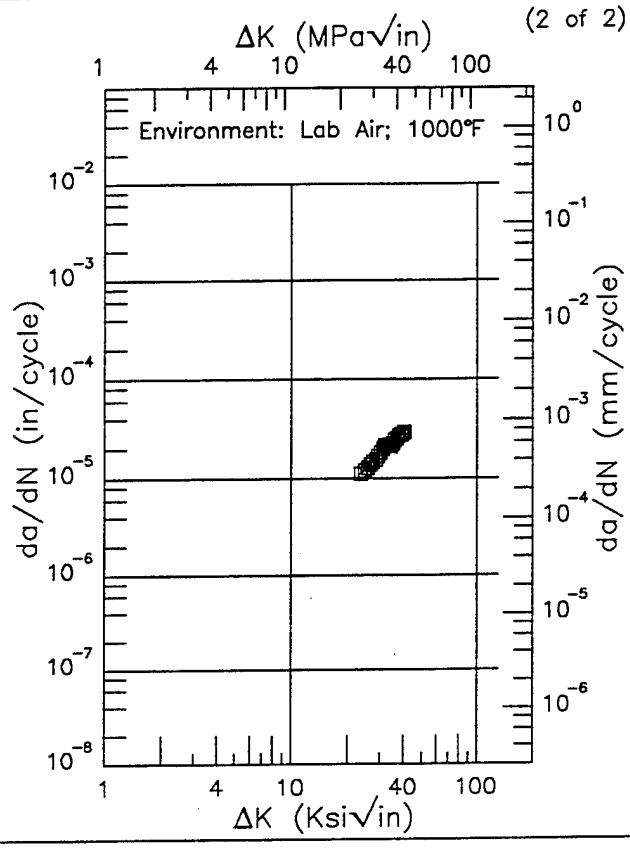
INCONEL 718

E

Condition/Ht: 1750F AC 1325F
Form: 0.06 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 174 ksi
Ult. Strength: 204.1 ksi
Specimen Thk: 0.061 in.
Specimen Width: 1.999 – 2 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.39 (min)	2.12
20.	2.26
25.	3.92
30.	6.43
35.	9.79
40.	14.3
50.	30.8
57.84 (max)	53.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.42 (min)	11.1
25.	12.1
30.	18.2
35.	23.3
40.	29.6
40.06 (max)	29.7

RMS % Error	Life Prediction Ratio Summary
2.79	0. .5 .8 1.25 2.

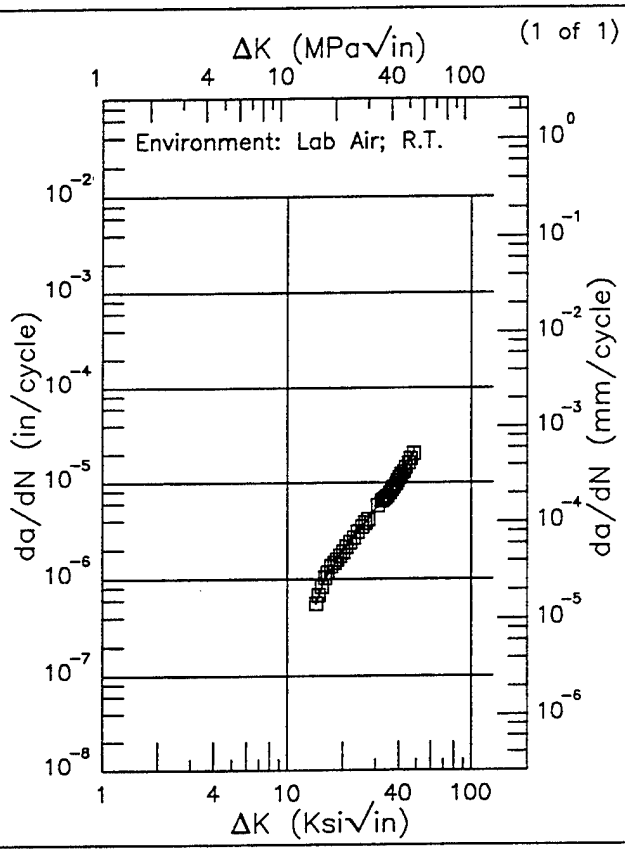
RMS % Error	Life Prediction Ratio Summary
2.89	0. .5 .8 1.25 2.

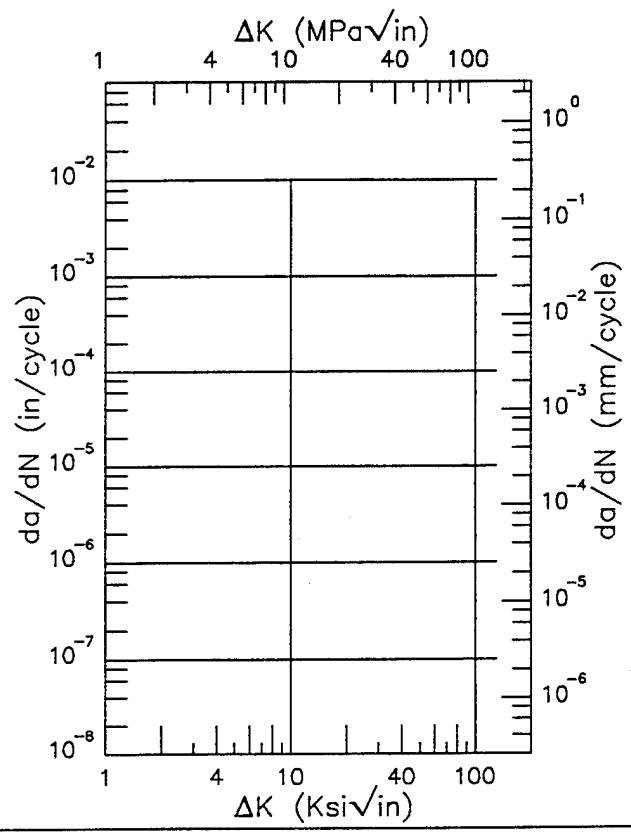
Figure 5.9.3.1.8

INCONEL 718 E

Condition/Ht: 1750F AC 1325F
Form: 0.06 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.05
Frequency: 5 Hz

Yield Strength: 174 ksi
Ult. Strength: 204.1 ksi
Specimen Thk: 0.061 in.
Specimen Width: 1.994 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.22 (min)	0.560
16.	1.00
20.	1.95
25.	3.29
30.	5.26
35.	7.54
40.	10.7
47.95 (max)	19.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.24	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

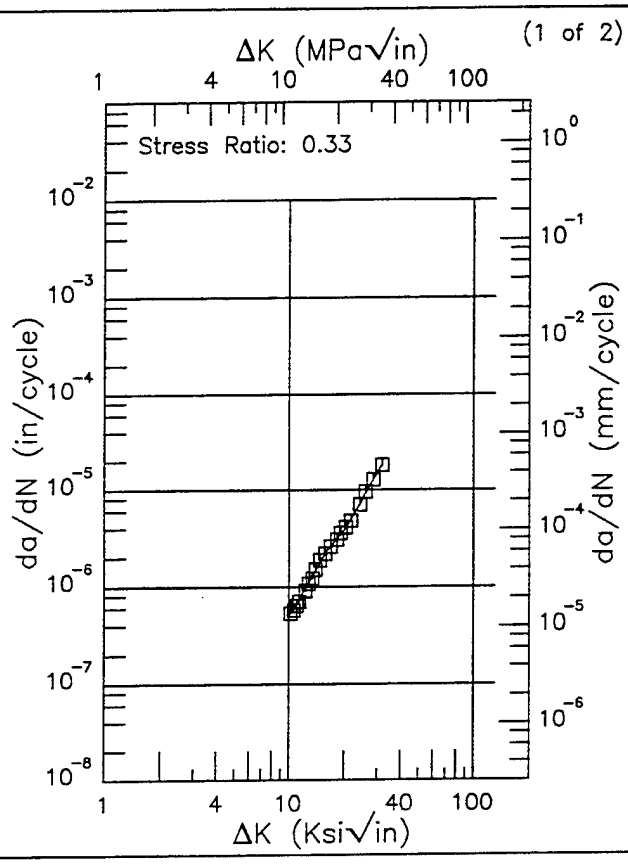
Figure 5.9.3.1.9

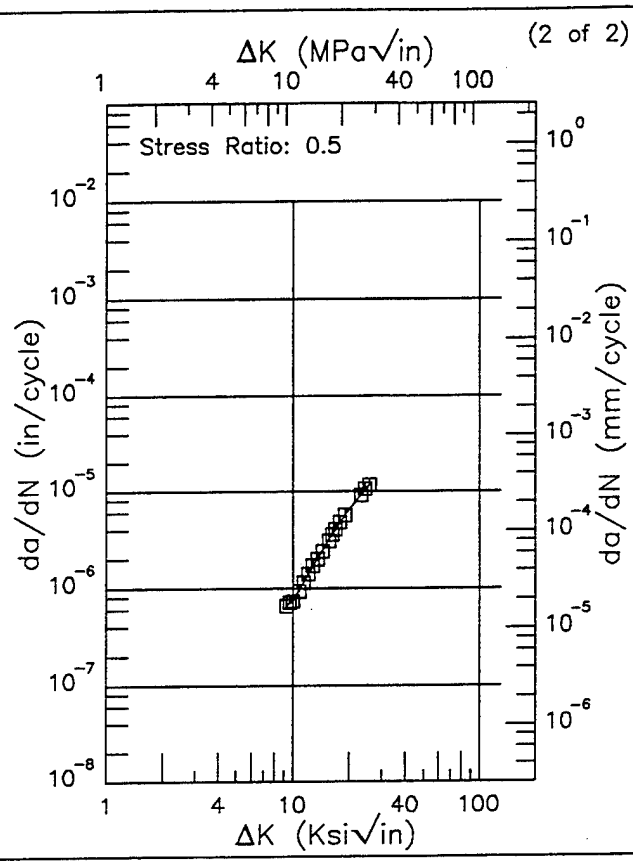
INCONEL 718

R

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation:
Frequency: 6.7 Hz
Environment: LAB AIR;1000°F

Yield Strength: 150.5 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.298 – 0.299 in.
Specimen Width: 1.152 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.17 (min)	0.522
13.	1.13
16.	2.31
20.	3.82
25.	8.12
30.	15.1
31.81 (max)	17.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.19 (min)	0.641
10.	0.760
13.	1.75
16.	3.36
20.	6.54
25.	10.9
25.68 (max)	11.7

RMS % Error 3.63

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error 2.27

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 5.9.3.1.10

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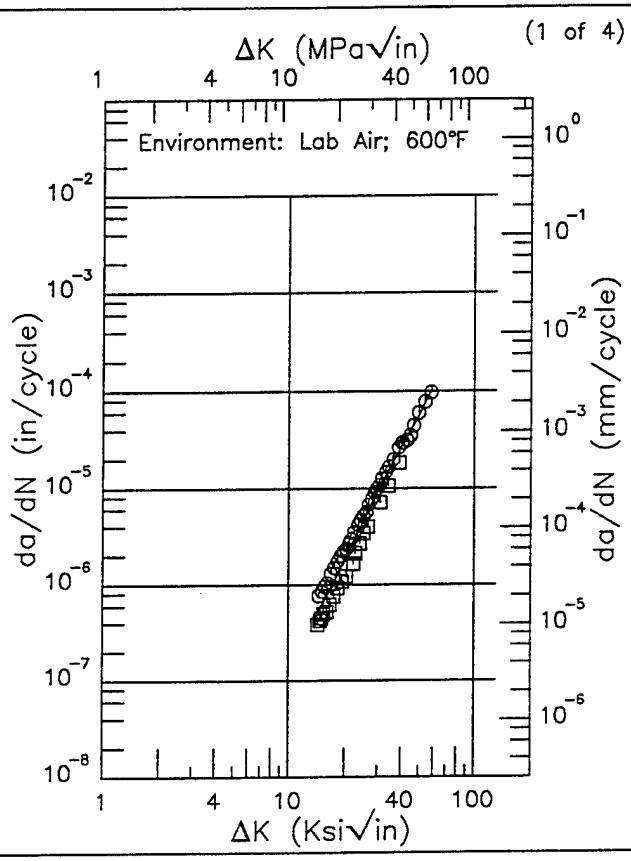
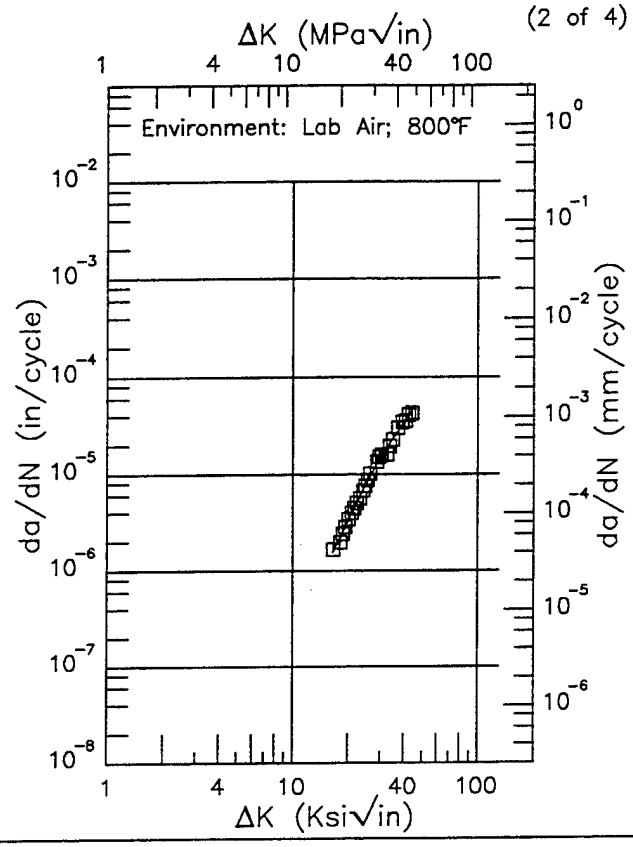
INCONEL 718

E

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 150.5 – 156.4 ksi
Ult. Strength: 191.3 – 200.7 ksi
Specimen Thk: 0.299 – 0.497 in.
Specimen Width: 1.152 – 1.999 in.
Ref: HD015;HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.29 (min)	0.513
16.	0.769
20.	1.82
25.	4.51
30.	9.32
35.	16.6
40.	26.5
50.	57.1
57.98 (max)	102.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.56 (min)	1.54
20.	3.24
25.	7.95
30.	15.2
35.	23.7
40.	34.1
44.06 (max)	46.0

RMS % Error	Life Prediction Ratio Summary
24.70	0. .5 .8 1.25 2.

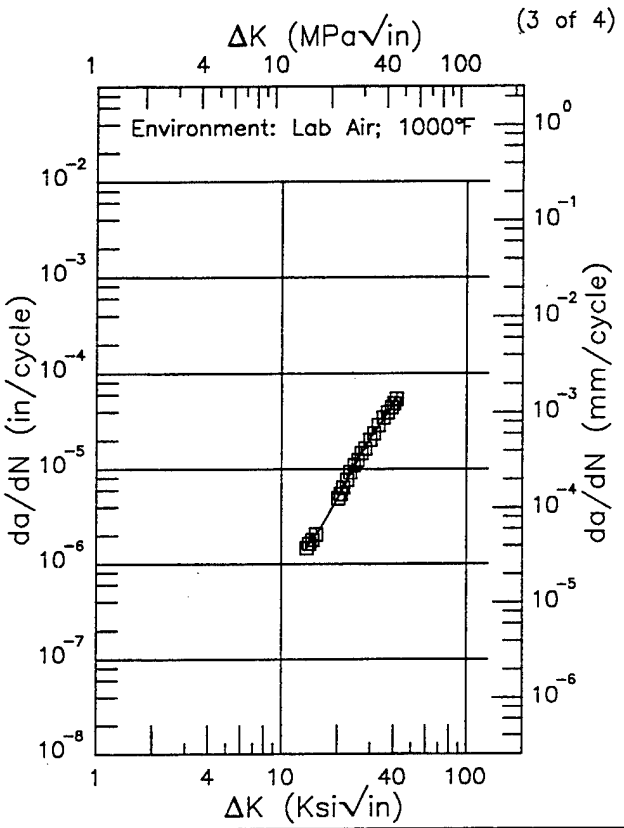
RMS % Error	Life Prediction Ratio Summary
6.13	0. .5 .8 1.25 2.

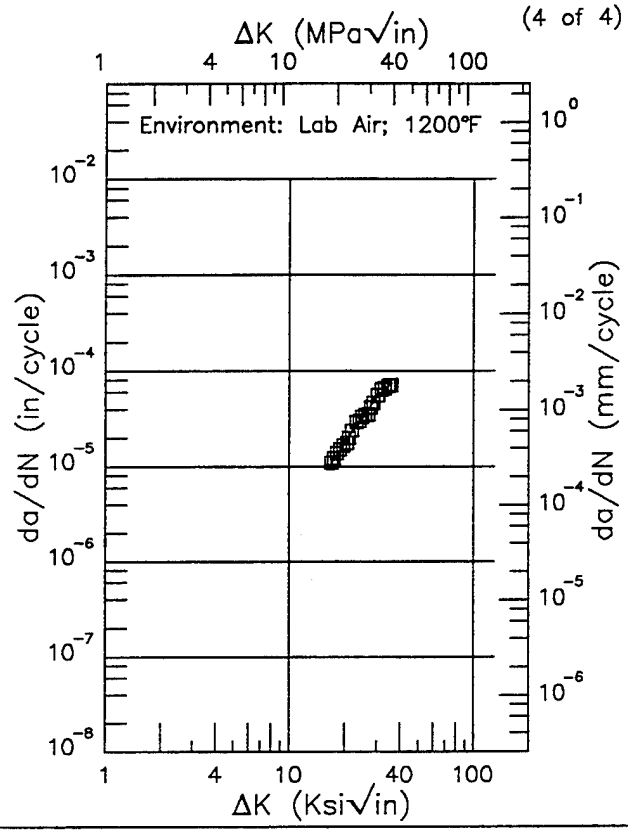
Figure 5.9.3.1.11

INCONEL 718 E

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 150.5 – 156.4 ksi
Ult. Strength: 191.3 – 200.7 ksi
Specimen Thk: 0.299 – 0.497 in.
Specimen Width: 1.152 – 1.999 in.
Ref: HD015;HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.60 (min)	1.48
16.	2.30
20.	4.97
25.	11.4
30.	20.9
35.	32.8
40.	47.7
41.58 (max)	53.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.93 (min)	10.8
20.	17.8
25.	32.2
30.	53.3
35.	71.5
35.62 (max)	72.6

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
2.40	0. .5 .8 1.25 2.	4.76	0. .5 .8 1.25 2.

Figure 5.9.3.1.11 (Concluded)

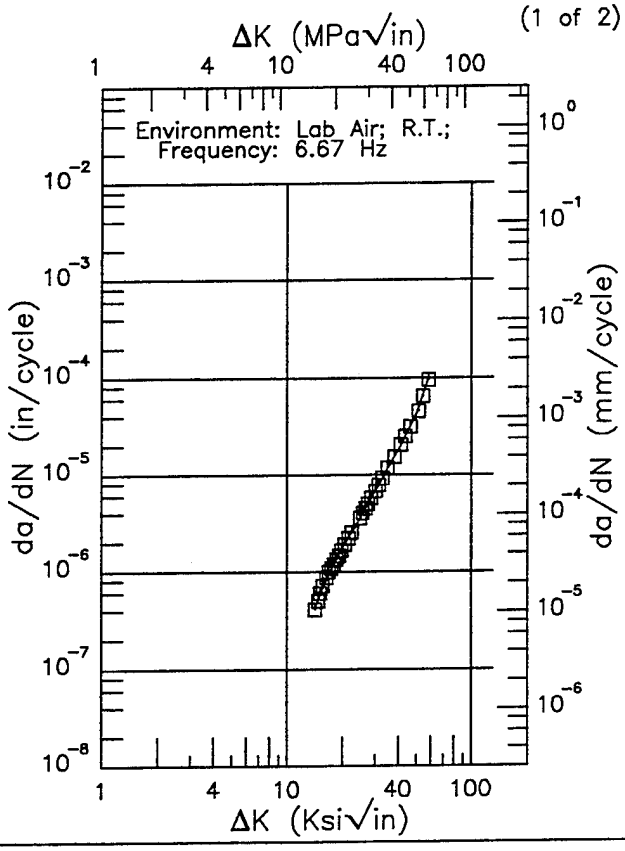
INCONEL 718

EF

Condition/Ht: 1750F AC 1325F 8HRS FC TO 1150F HELD 18HRS AC
Form: 0.5 in. Plate
Specimen Type: CT
Orientation:
Stress Ratio: 0.05

Yield Strength: 150.5 – 156.4 ksi
Ult. Strength: 191.3 – 200.7 ksi
Specimen Thk: 0.298 – 0.495 in.
Specimen Width: 1.151 – 1.998 in.
Ref: HD017;HD015

(1 of 2)



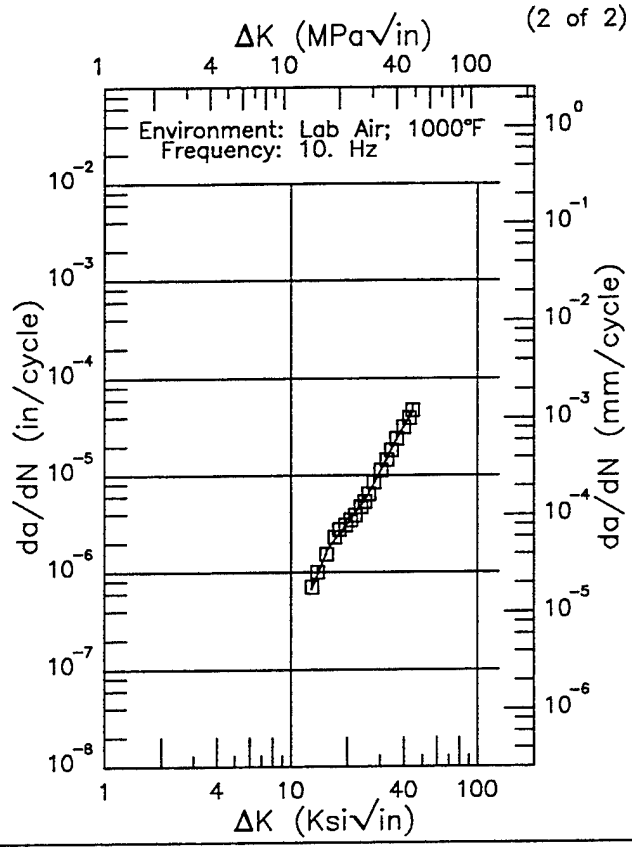
ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.19 (min)	0.426
16.	0.764
20.	1.77
25.	3.63
30.	6.76
35.	11.6
40.	18.2
50.	42.5
58.21 (max)	96.7

RMS % Error 2.68

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.91 (min)	0.658
13.	0.688
16.	1.80
20.	3.16
25.	5.60
30.	10.7
35.	20.1
40.	31.9
44.45 (max)	46.0

RMS % Error 4.61

Life Prediction Ratio Summary

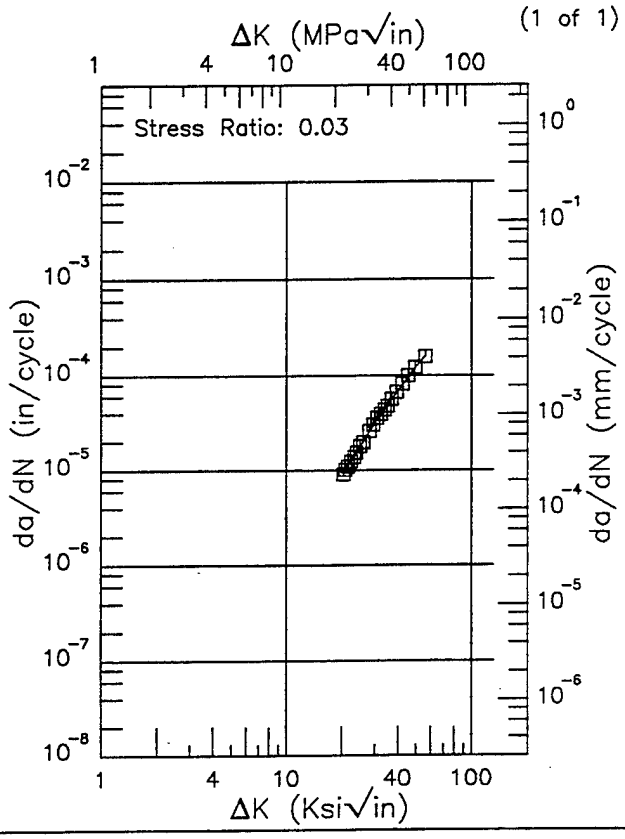
0. .5 .8 1.25 2.

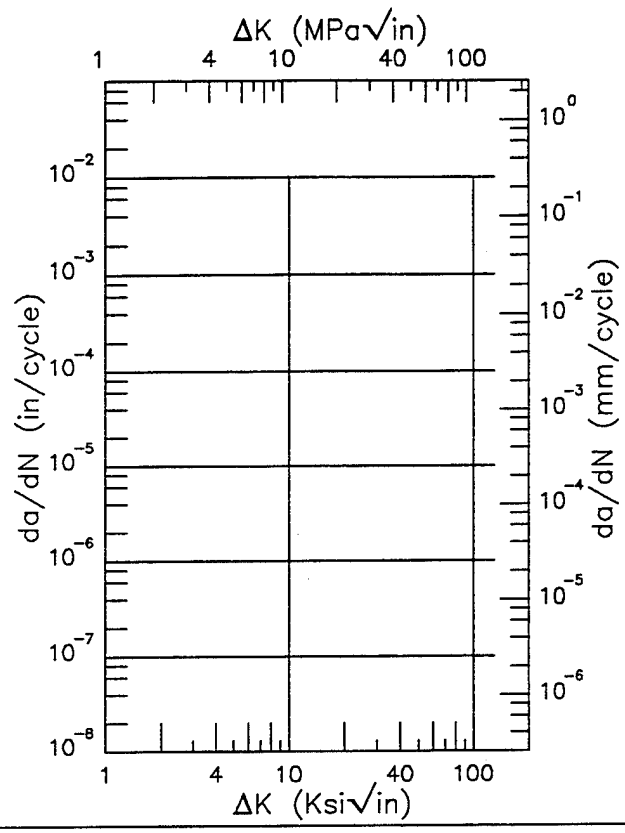
Figure 5.9.3.1.12

INCONEL 718 R

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 0.7 Hz
Environment: LAB AIR;1200°F

Yield Strength: 150.5 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.477 in.
Specimen Width: 1.997 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.23 (min)	9.30
25.	17.7
30.	31.8
35.	47.6
40.	69.7
50.	125.
55.76 (max)	158.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 2.05

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

Figure 5.9.3.1.13

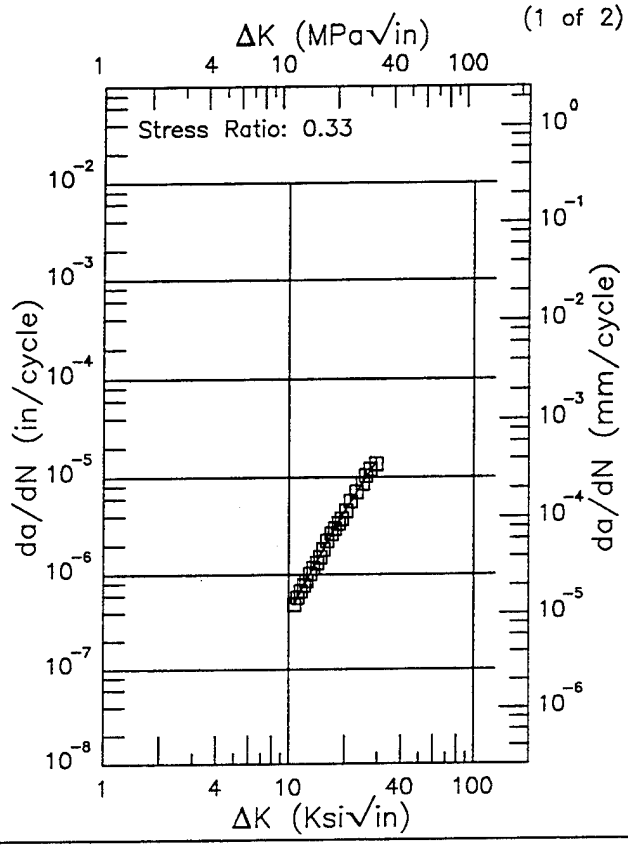
R

INCONEL 718

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 6.7 Hz
Environment: LAB AIR;800°F

Yield Strength: 150.5 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.477 – 0.478 in.
Specimen Width: 1.996 in.
Ref: HD015

(1 of 2)

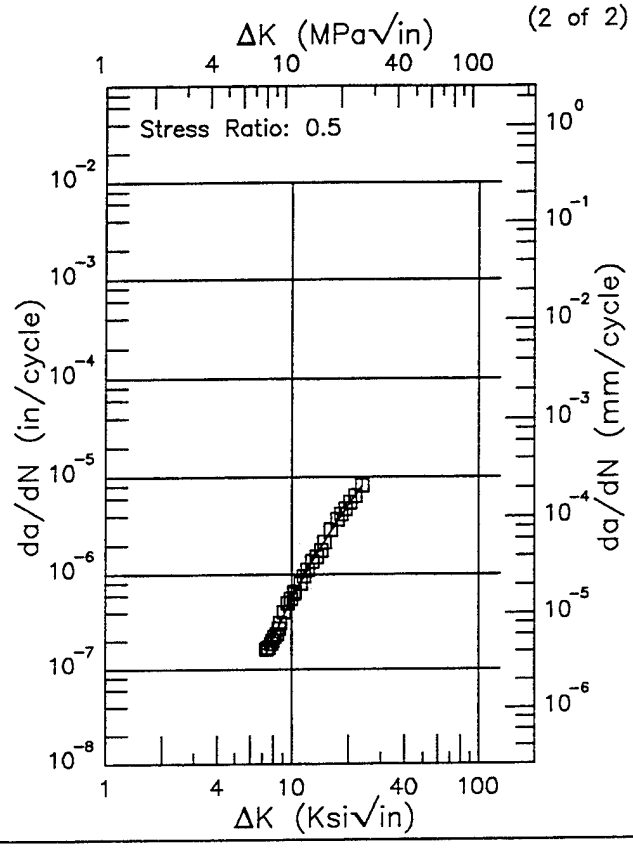


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.68 (min)	0.499
13.	1.00
16.	2.08
20.	4.40
25.	8.86
29.34 (max)	14.1

RMS % Error 2.61

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.32 (min)	0.147
8.	0.220
9.	0.362
10.	0.548
13.	1.39
16.	2.68
20.	5.14
23.56 (max)	8.10

RMS % Error 4.79

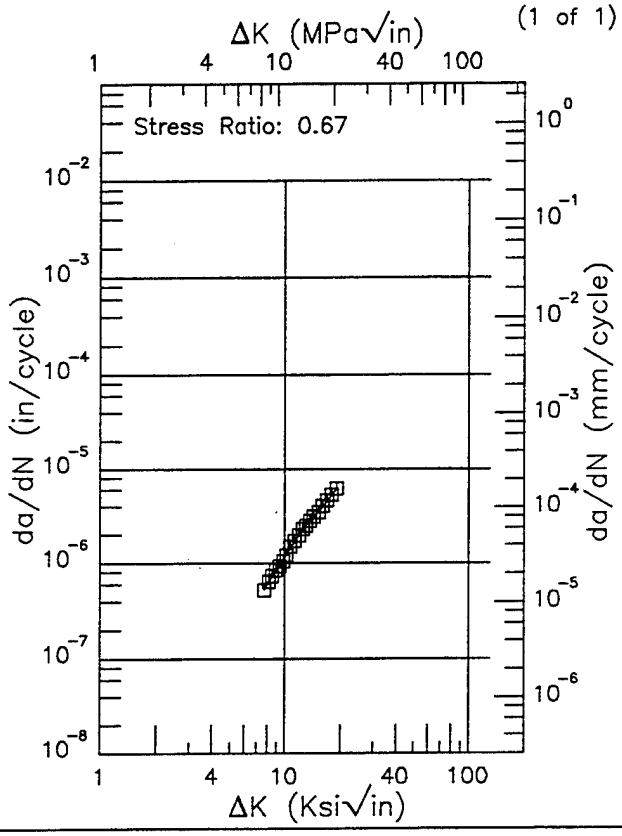
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

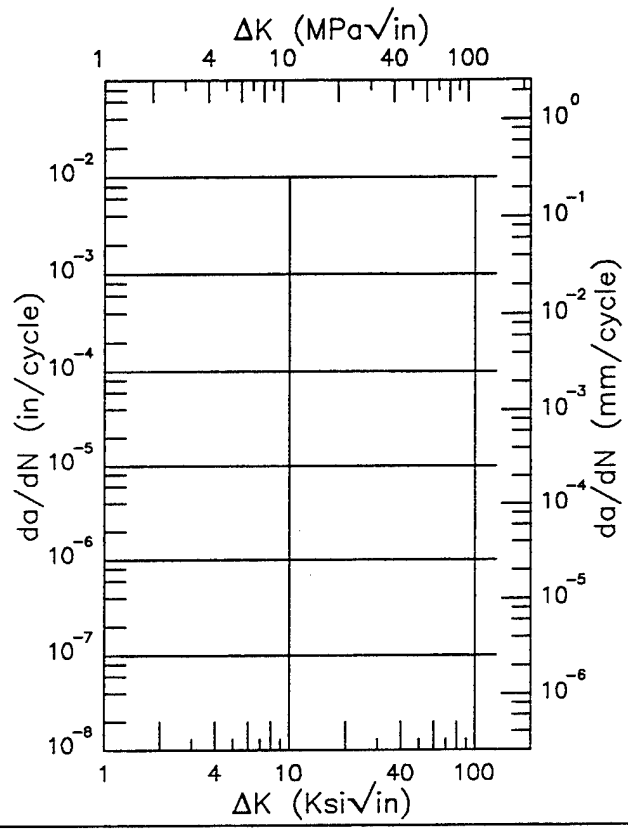
Figure 5.9.3.1.14

INCONEL 718 R

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 6.7 Hz
Environment: LAB AIR;1000°F

Yield Strength: 150.5 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.479 in.
Specimen Width: 1.993 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.74 (min)	0.531
8.	0.591
9.	0.848
10.	1.16
13.	2.50
16.	3.95
18.84 (max)	6.13

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.29	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

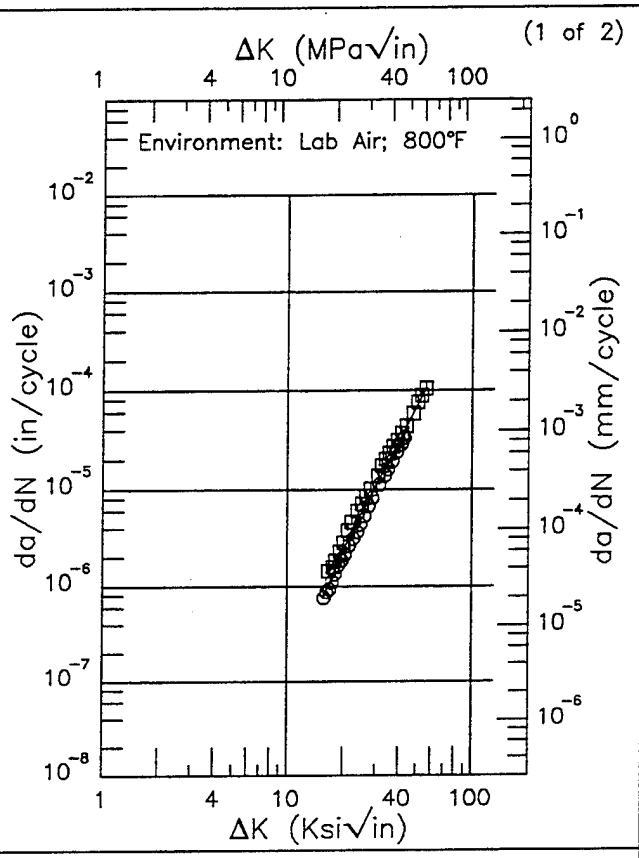
Figure 5.9.3.1.15

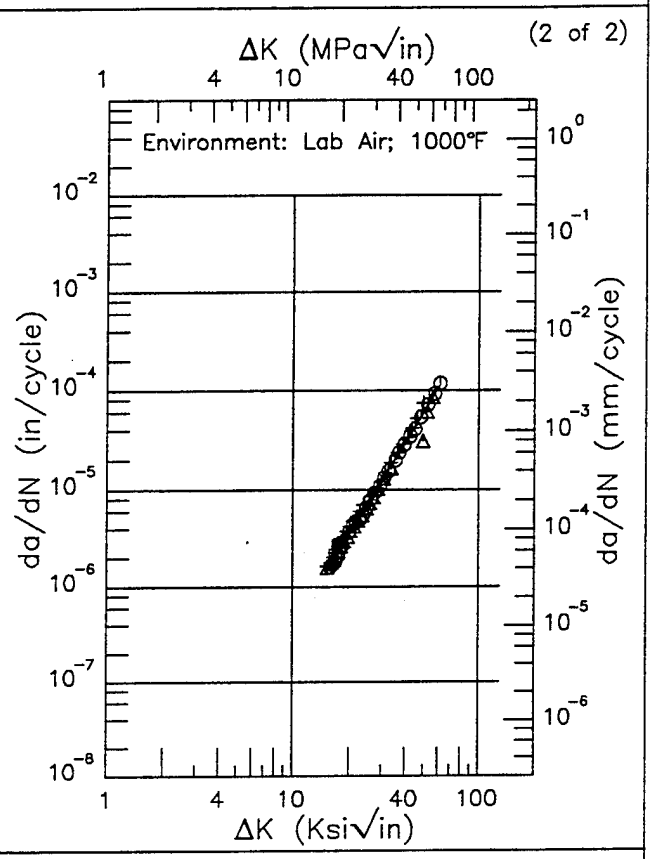
INCONEL 718

E

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.05
Frequency: 0.7 – 6.7 Hz

Yield Strength: 150.5 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.476 – 0.478 in.
Specimen Width: 1.996 – 1.998 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.64 (min)	0.781
16.	0.871
20.	2.34
25.	5.62
30.	10.9
35.	18.8
40.	30.1
50.	68.5
56.07 (max)	107.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.20 (min)	1.52
16.	1.79
20.	3.62
25.	7.18
30.	12.5
35.	19.9
40.	29.8
50.	59.2
60.	106.
61.27 (max)	113.

RMS % Error	Life Prediction Ratio Summary
17.42	0. .5 .8 1.25 2.

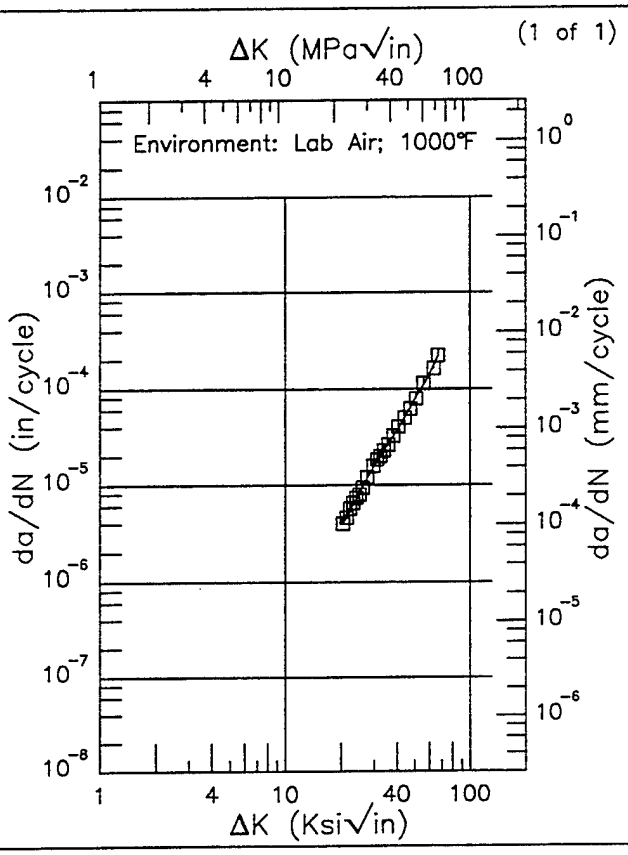
RMS % Error	Life Prediction Ratio Summary
9.25	0. .5 .8 1.25 2.

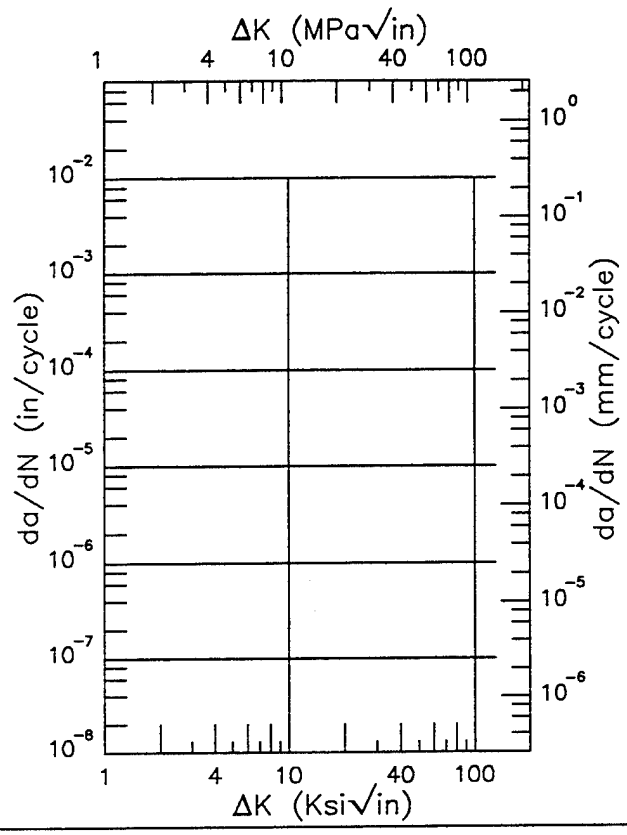
Figure 5.9.3.1.16

INCONEL 718 E

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 129 ksi
Ult. Strength: 160.1 ksi
Specimen Thk: 0.476 in.
Specimen Width: 1.998 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.36 (min)	3.96
25.	8.47
30.	15.9
35.	25.3
40.	37.2
50.	78.2
60.	139.
66.35 (max)	215.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.80	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

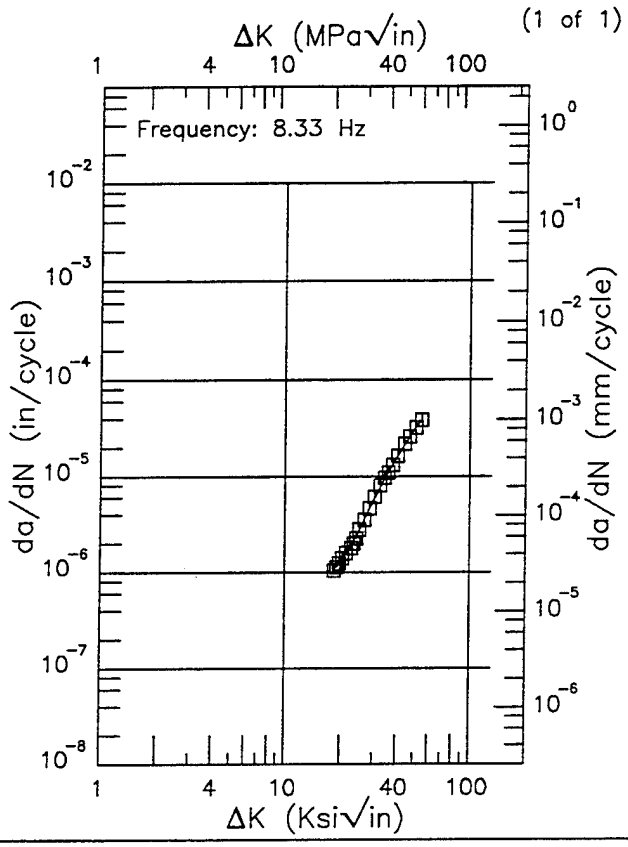
Figure 5.9.3.1.17

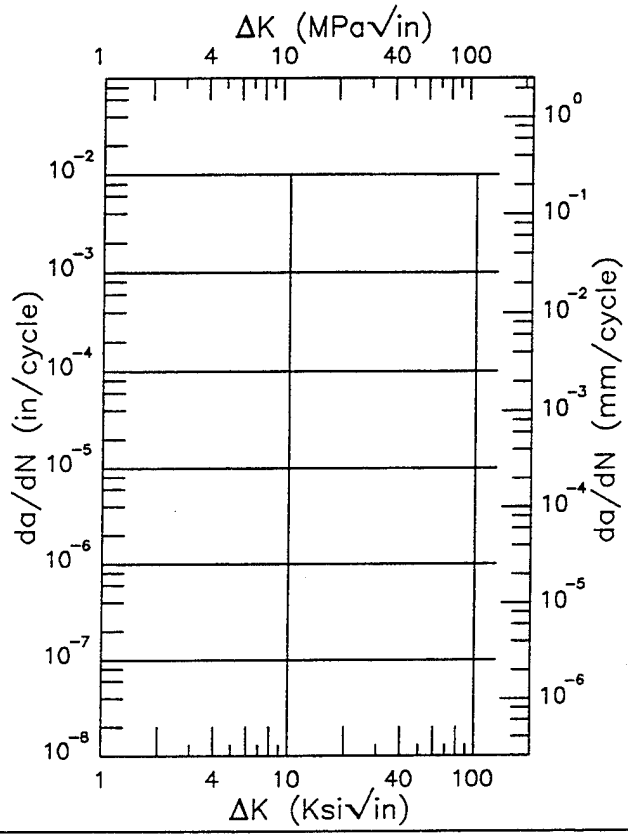
INCONEL 718

F

Condition/Ht: 1750F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.05
Environment: LAB AIR; RT

Yield Strength: 150.5 ksi
Ult. Strength: 191.3 ksi
Specimen Thk: 0.477 in.
Specimen Width: 1.998 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.26 (min)	1.10
20.	1.28
25.	2.68
30.	5.68
35.	10.3
40.	15.7
50.	30.6
54.46 (max)	37.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 3.72

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 5.9.3.1.18

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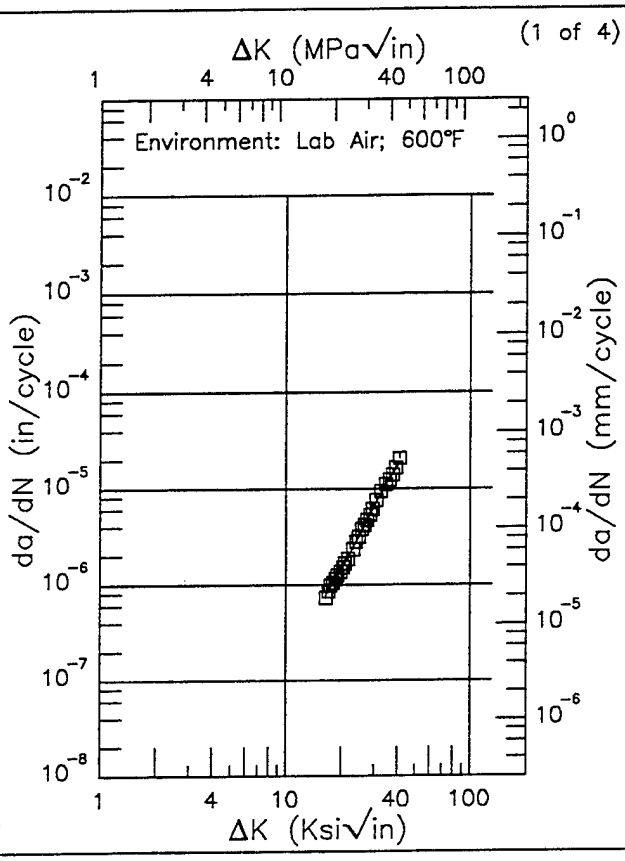
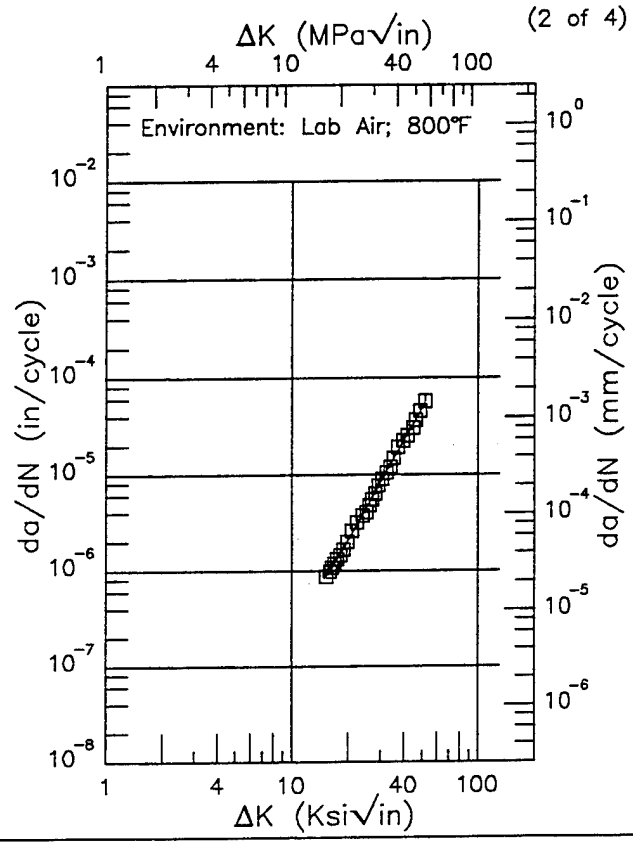
INCONEL 718

E

Condition/Ht: 1750F AC 1325F
Form: Forging
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 168.4 ksi
Ult. Strength: 196.7 ksi
Specimen Thk: 0.402 – 0.403 in.
Specimen Width: 1.996 – 1.998 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.43 (min)	0.786
20.	1.44
25.	3.28
30.	6.61
35.	11.5
40.	17.4
41.28 (max)	19.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.22 (min)	0.849
16.	0.993
20.	2.05
25.	4.40
30.	8.32
35.	14.3
40.	22.7
50.	48.6
51.90 (max)	54.9

RMS % Error	Life Prediction Ratio Summary
3.60	0. .5 .8 1.25 2.

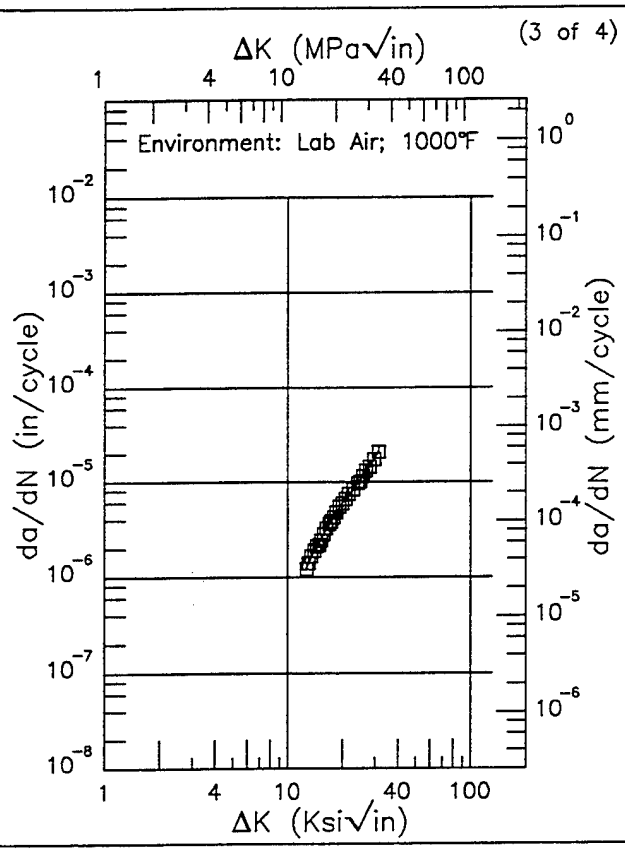
RMS % Error	Life Prediction Ratio Summary
4.16	0. .5 .8 1.25 2.

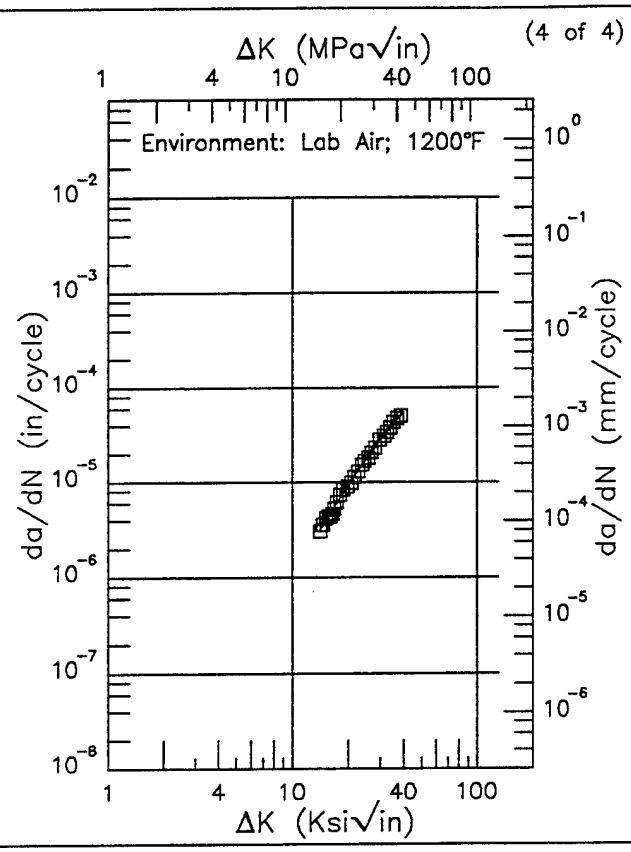
Figure 5.9.3.1.19

INCONEL 718 E

Condition/Ht: 1750F AC 1325F
Form: Forging
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 168.4 ksi
Ult. Strength: 196.7 ksi
Specimen Thk: 0.402 – 0.403 in.
Specimen Width: 1.996 – 1.998 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.64 (min)	1.24
13.	1.40
16.	3.02
20.	6.04
25.	10.5
30.	18.2
31.19 (max)	20.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.06 (min)	3.10
16.	4.69
20.	9.37
25.	17.3
30.	28.2
35.	42.3
38.42 (max)	50.8

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
2.43	0. .5 .8 1.25 2.	4.00	0. .5 .8 1.25 2.

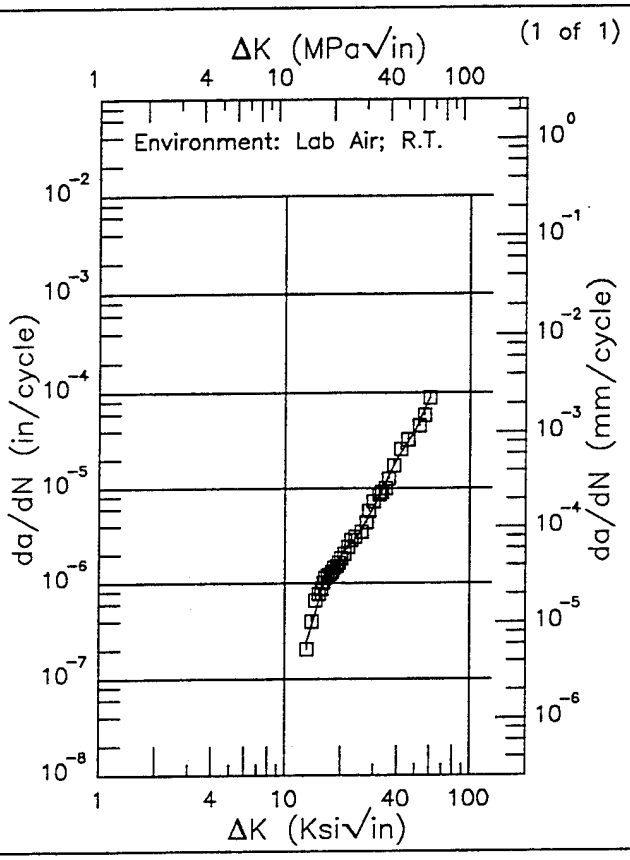
Figure 5.9.3.1.19 (Concluded)

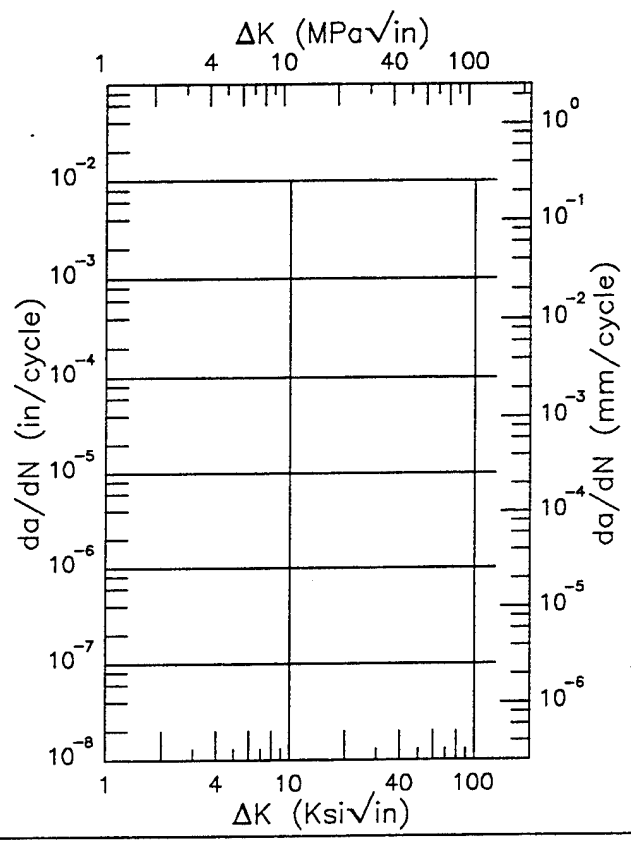
INCONEL 718

E

Condition/Ht: 1750F AC 1325F
Form: Forging
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 10 Hz

Yield Strength: 168.4 ksi
Ult. Strength: 195.7 ksi
Specimen Thk: 0.402 in.
Specimen Width: 1.998 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.06 (min)	0.238
16.	0.925
20.	1.93
25.	3.33
30.	6.33
35.	12.0
40.	20.6
50.	40.7
59.94 (max)	88.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 9.56

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

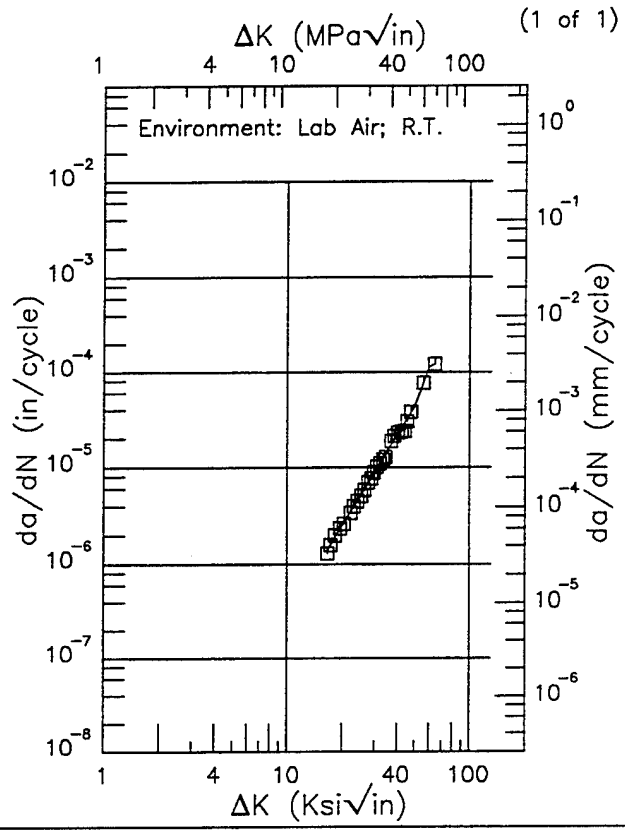
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

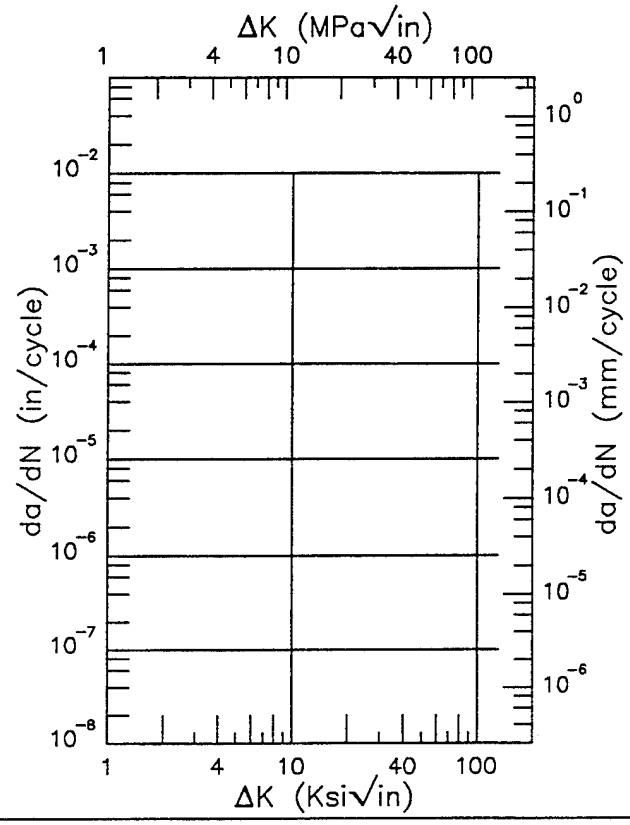
Figure 5.9.3.1.20

INCONEL 718 E

Condition/Ht: 1750F AC 1325F
Form: 2 in. Forged Bar
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Frequency: 10 Hz

Yield Strength: 152.1 ksi
Ult. Strength: 194.4 ksi
Specimen Thk: 0.304 in.
Specimen Width: 1.48 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.57 (min)	1.36
20.	2.56
25.	4.99
30.	8.81
35.	14.6
40.	21.8
50.	43.7
60.	114.
63.69 (max)	121.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.64	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

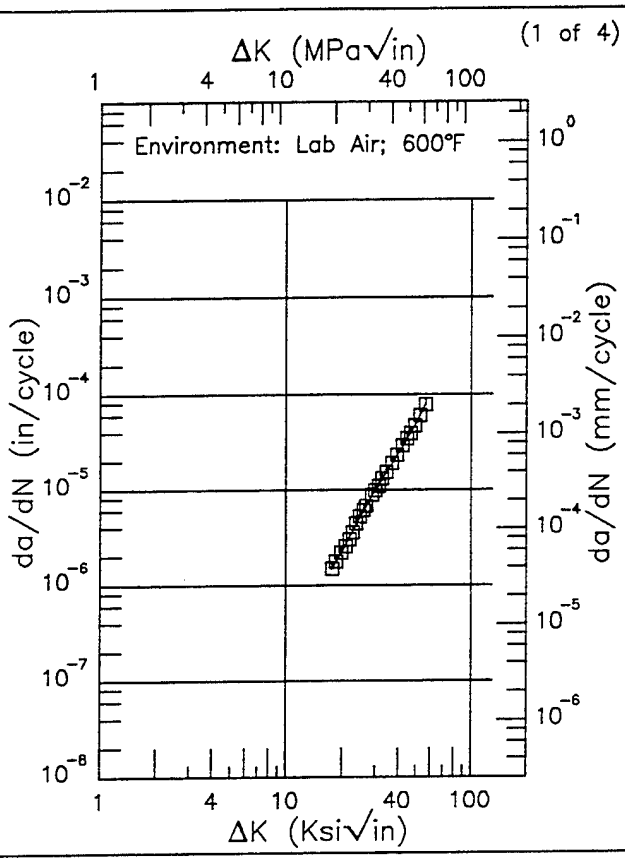
Figure 5.9.3.1.21

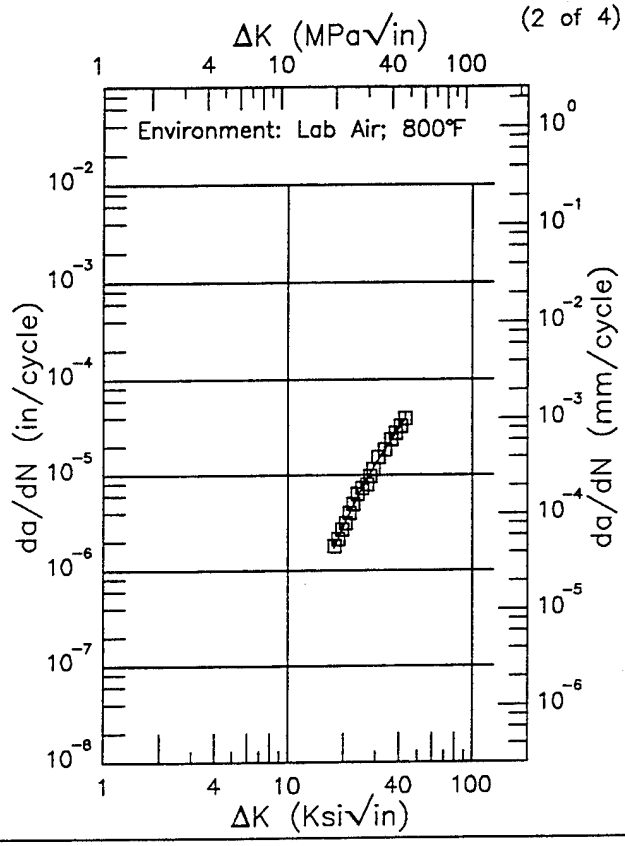
INCONEL 718

E

Condition/Ht: 1750F AC 1325F
Form: 2 in. Forged Bar
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 152.1 ksi
Ult. Strength: 194.4 ksi
Specimen Thk: 0.303 – 0.304 in.
Specimen Width: 1.478 – 1.481 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.61 (min)	1.47
20.	2.26
25.	5.30
30.	10.0
35.	16.0
40.	24.2
50.	49.4
56.32 (max)	78.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.80 (min)	1.72
20.	2.88
25.	6.91
30.	12.9
35.	21.0
40.	31.2
42.93 (max)	38.3

RMS % Error	Life Prediction Ratio Summary
2.02	0. .5 .8 1.25 2.

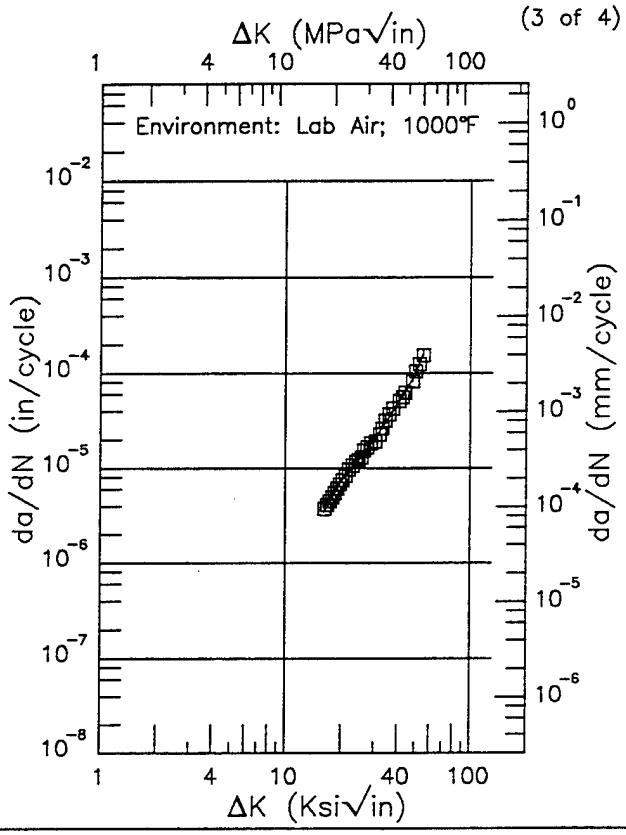
RMS % Error	Life Prediction Ratio Summary
4.92	0. .5 .8 1.25 2.

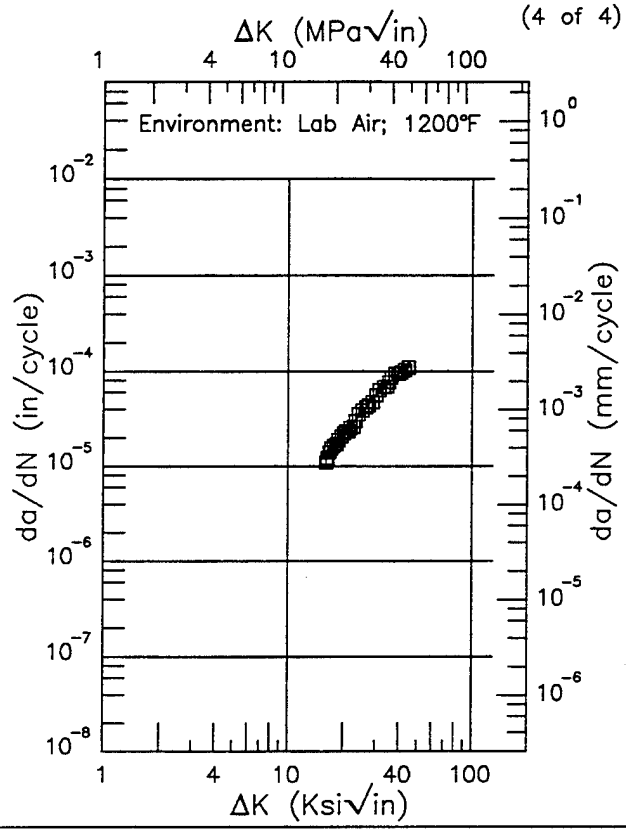
Figure 5.9.3.1.22

INCONEL 718 E

Condition/Ht: 1750F AC 1325F
Form: 2 in. Forged Bar
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.7 Hz

Yield Strength: 152.1 ksi
Ult. Strength: 194.4 ksi
Specimen Thk: 0.303 – 0.304 in.
Specimen Width: 1.478 – 1.481 in.
Ref: HD017





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.17 (min)	3.47
20.	7.35
25.	12.7
30.	19.9
35.	31.5
40.	47.6
50.	97.3
55.00 (max)	158.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.10 (min)	12.5
20.	21.0
25.	36.4
30.	55.6
35.	76.1
40.	95.3
44.50 (max)	110.

RMS % Error	Life Prediction Ratio Summary
4.05	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
4.63	0. .5 .8 1.25 2.

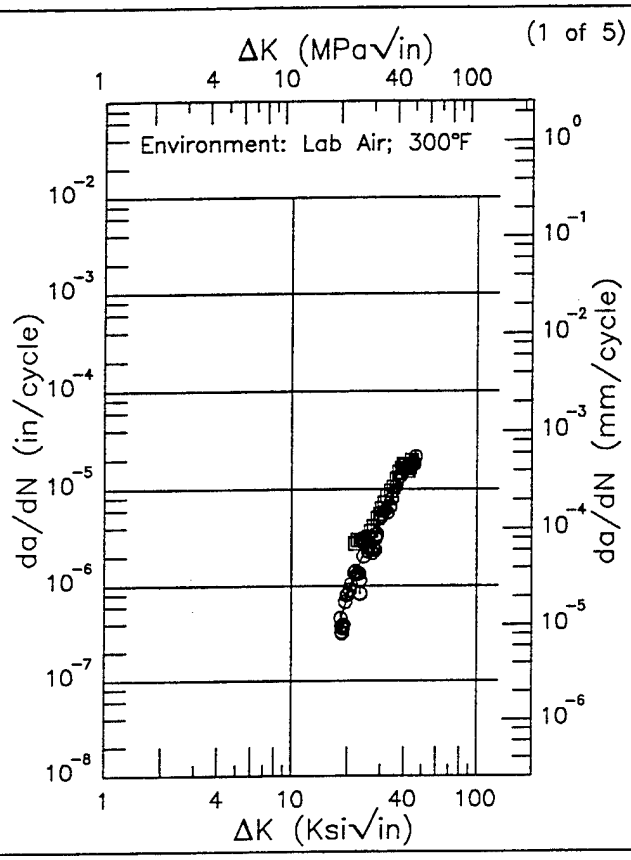
Figure 5.9.3.1.22 (Concluded)

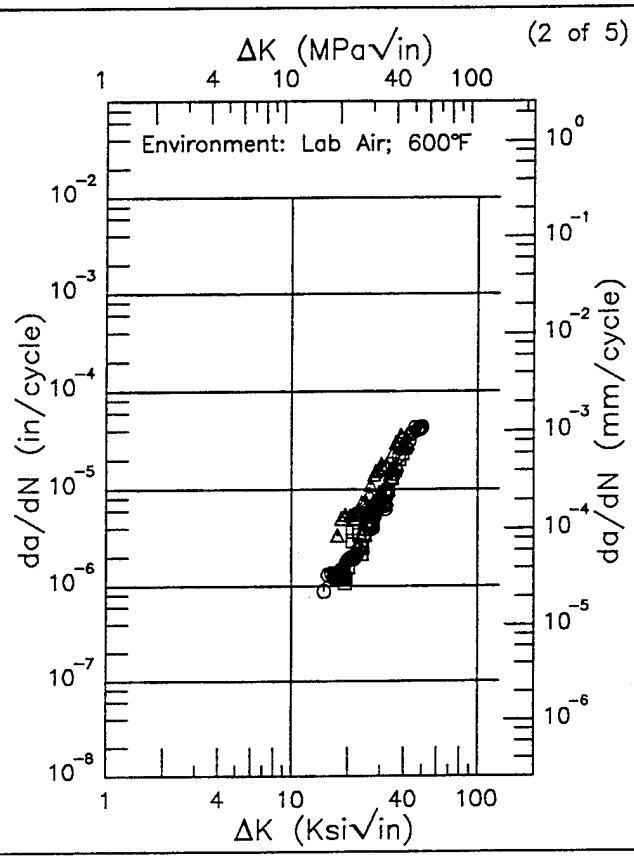
INCONEL 718

E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: –0.33
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.255 in.
Specimen Width: 0.903 – 0.911 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.27 (min)	0.428
20.	0.771
25.	2.54
30.	5.46
35.	9.46
40.	14.6
46.06 (max)	22.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.88 (min)	1.06
16.	1.19
20.	2.08
25.	4.42
30.	8.75
35.	15.6
40.	24.9
49.95 (max)	47.9

RMS % Error	Life Prediction Ratio Summary
29.13	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
50.94	0. .5 .8 1.25 2.

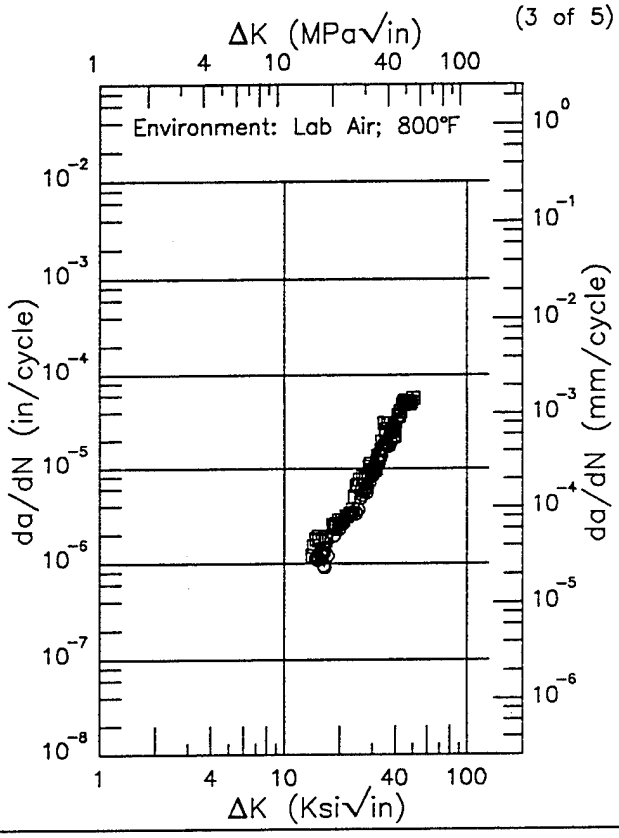
Figure 5.9.3.1.23

INCONEL 718 E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: –0.33
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.255 in.
Specimen Width: 0.903 – 0.911 in.
Ref: GE005

(3 of 5)

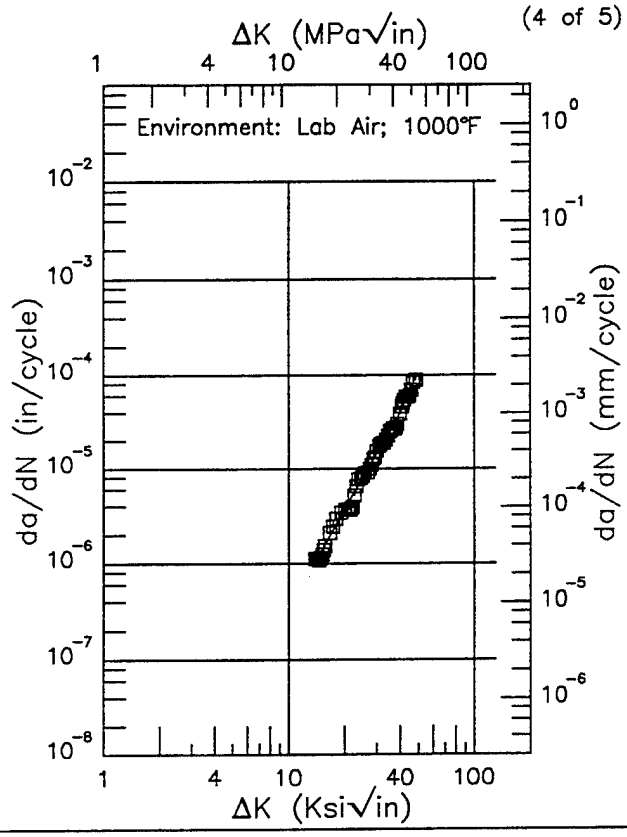


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.17 (min)	1.20
16.	1.42
20.	2.42
25.	5.00
30.	9.86
35.	17.9
40.	29.7
50.	64.2
50.02 (max)	64.3

RMS % Error 19.18

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

(4 of 5)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.89 (min)	0.986
16.	1.67
20.	3.67
25.	7.83
30.	14.4
35.	24.4
40.	40.0
48.37 (max)	92.9

RMS % Error 9.74

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

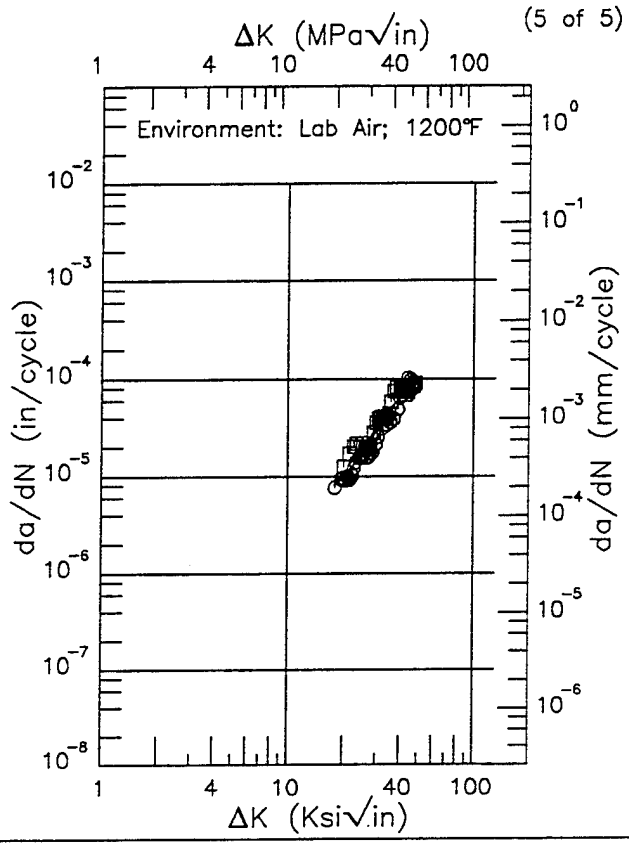
Figure 5.9.3.1.23 (Continued)

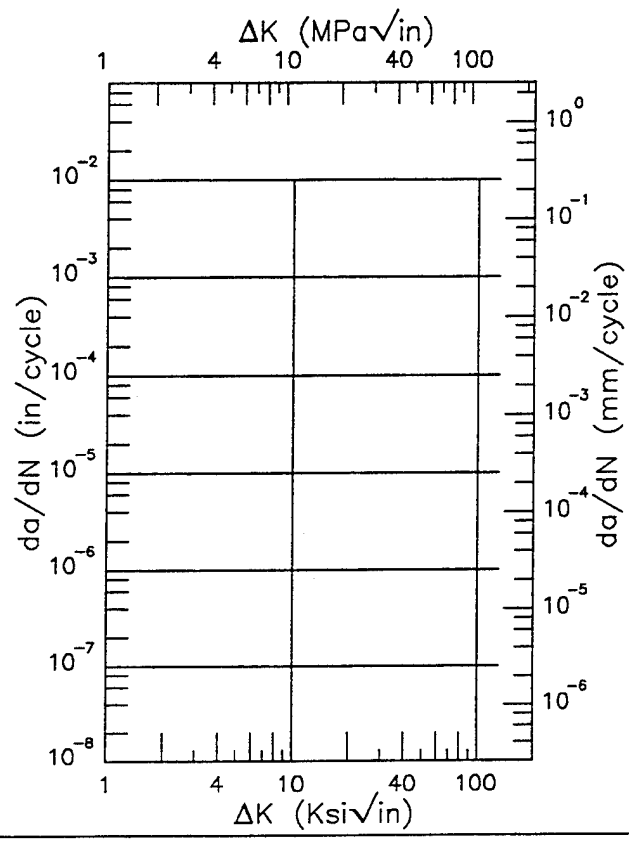
INCONEL 718

E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: –0.33
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.255 in.
Specimen Width: 0.903 – 0.911 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.86 (min)	8.13
20.	9.75
25.	16.8
30.	28.8
35.	45.6
40.	65.4
48.27 (max)	95.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
19.95	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.23 (Concluded)

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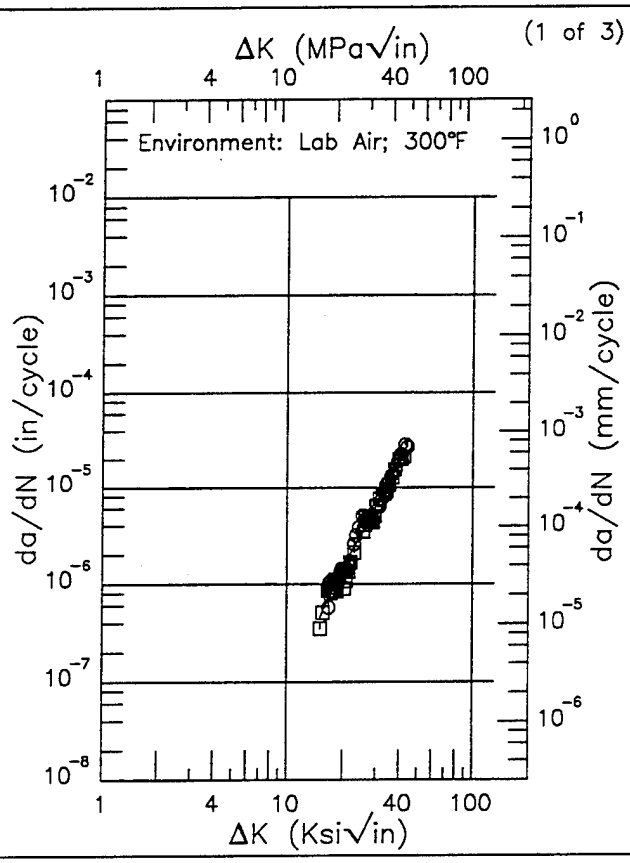
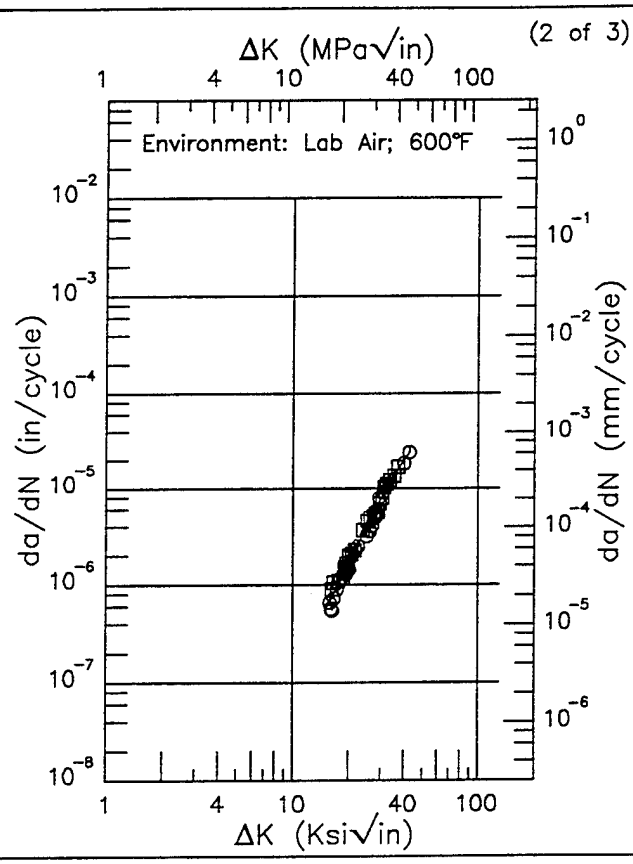
INCONEL 718

E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.252 in.
Specimen Width: 0.9 – 0.906 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.09 (min)	0.456
16.	0.592
20.	1.46
25.	3.28
30.	6.27
35.	11.1
40.	18.8
44.05 (max)	28.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.82 (min)	0.655
16.	0.682
20.	1.59
25.	3.84
30.	7.72
35.	13.2
40.	20.0
42.52 (max)	23.6

RMS % Error	Life Prediction Ratio Summary
16.69	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
13.10	0. .5 .8 1.25 2.

Figure 5.9.3.1.24

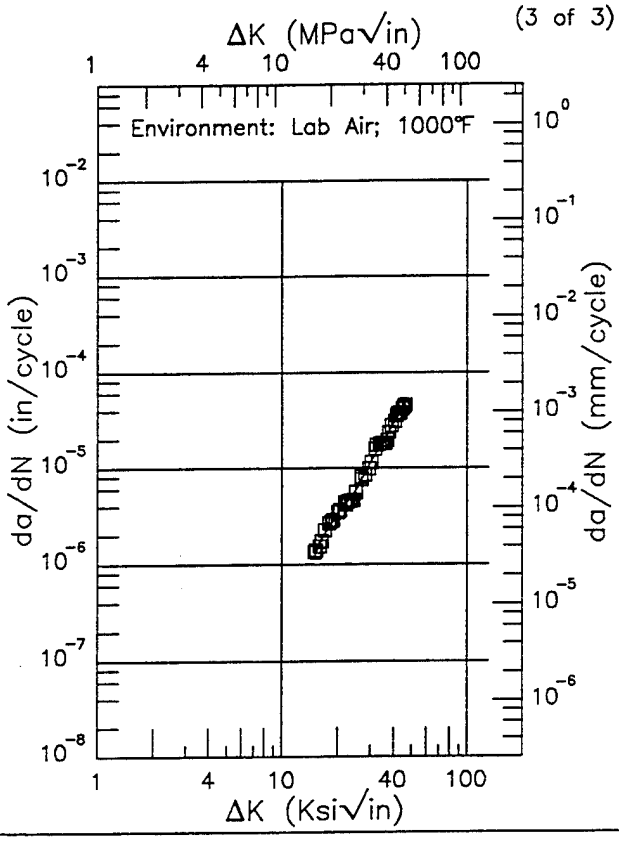
INCONEL 718

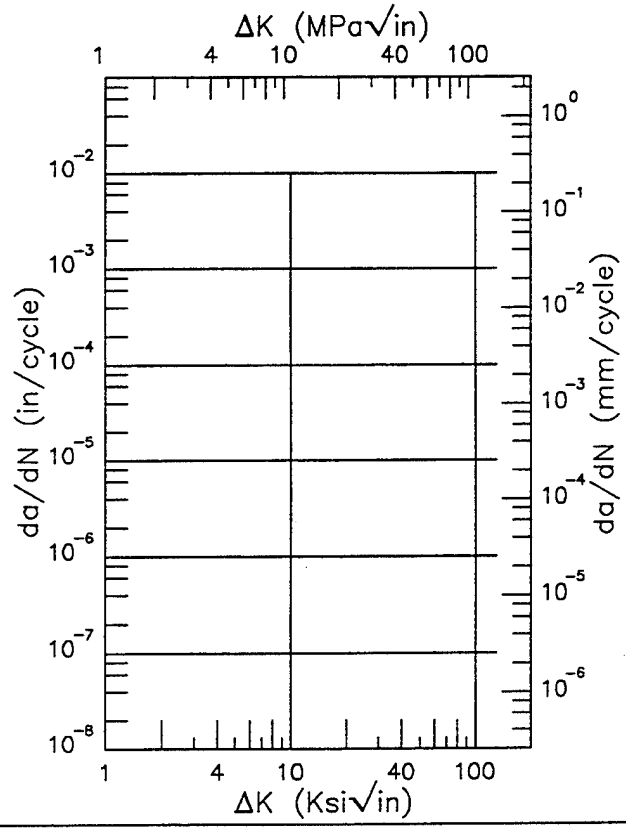
E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.252 in.
Specimen Width: 0.9 – 0.906 in.
Ref: GE005

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.92 (min)	1.17
16.	1.73
20.	3.32
25.	5.86
30.	11.4
35.	18.7
40.	29.4
45.99 (max)	45.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 7.64

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

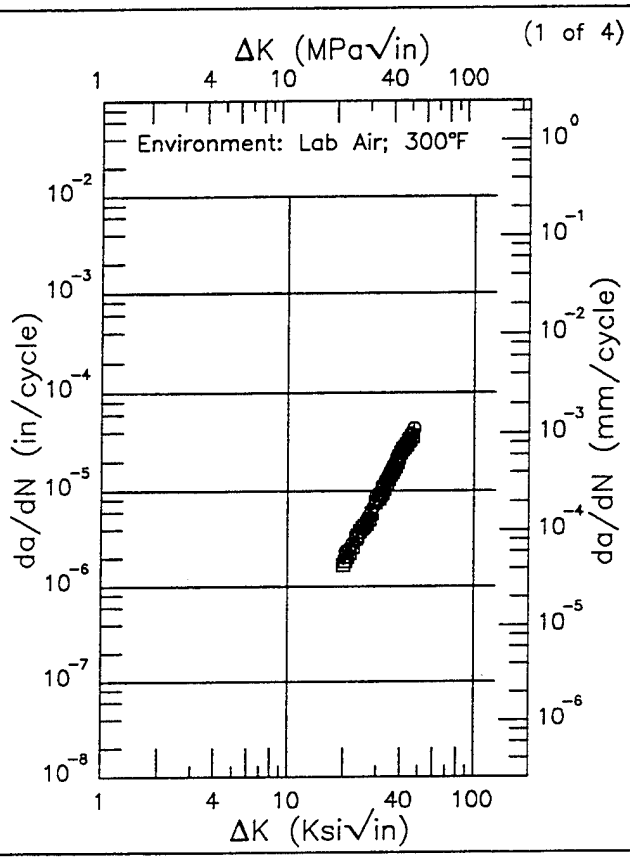
Figure 5.9.3.1.24 (Concluded)

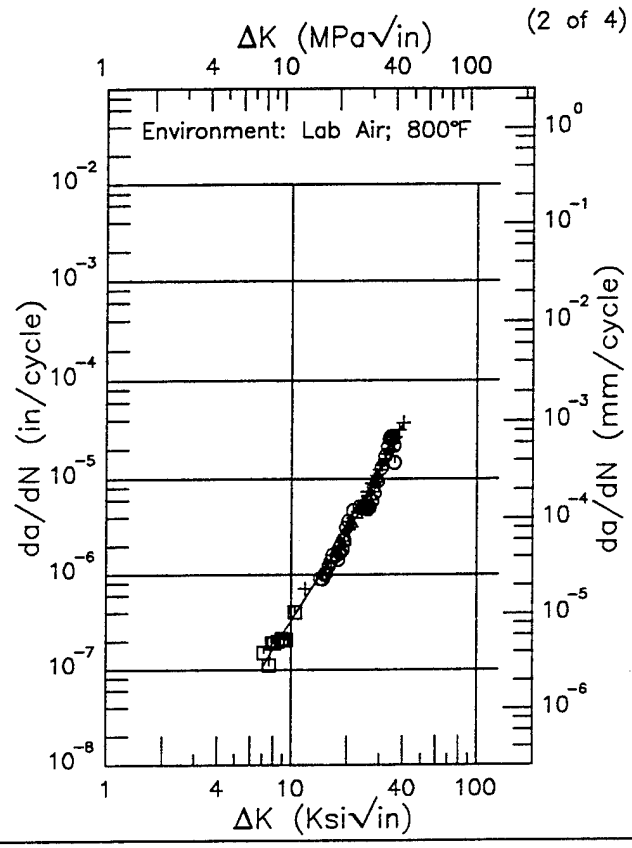
INCONEL 718

E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.03
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.254 in.
Specimen Width: 0.9 – 0.91 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.86 (min)	1.82
20.	1.86
25.	3.98
30.	7.94
35.	14.3
40.	23.4
47.23 (max)	40.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.10 (min)	0.111
8.	0.165
9.	0.240
10.	0.332
13.	0.731
16.	1.36
20.	2.72
25.	5.85
30.	12.3
35.	23.9
40.	35.9
40.11 (max)	36.1

RMS % Error	Life Prediction Ratio Summary
5.59	0. .5 .8 1.25 2.

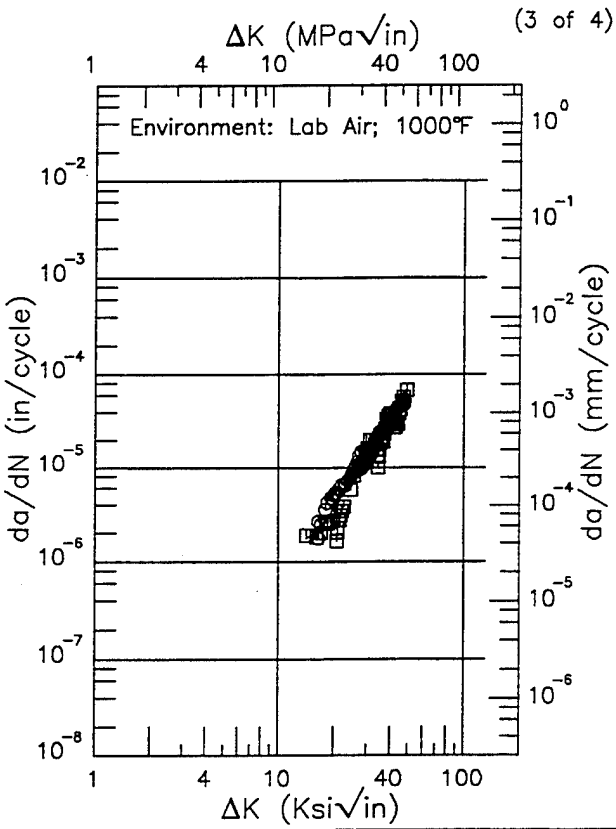
RMS % Error	Life Prediction Ratio Summary
15.90	0. .5 .8 1.25 2.

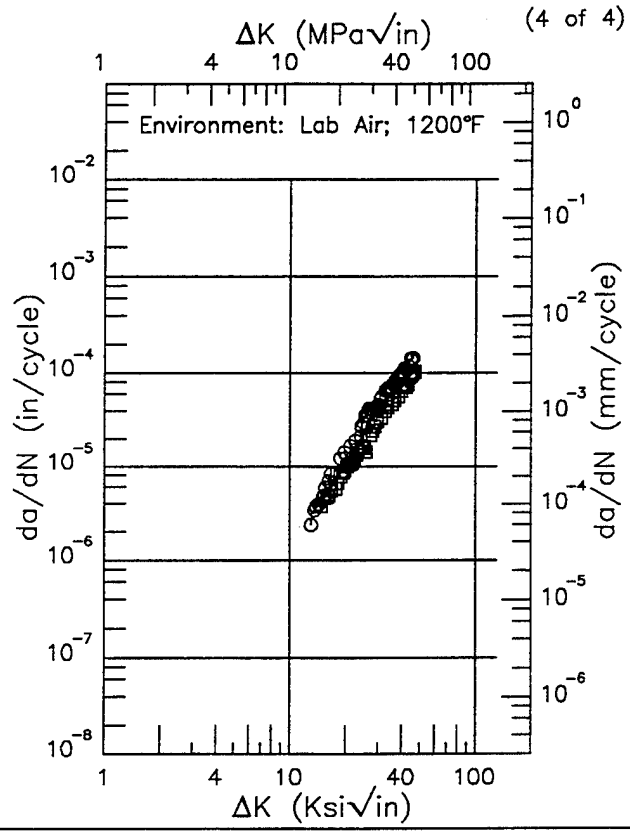
Figure 5.9.3.1.25

INCONEL 718 E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.03
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.254 in.
Specimen Width: 0.9 – 0.91 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.19 (min)	1.76
16.	2.00
20.	3.56
25.	7.84
30.	14.4
35.	21.0
40.	28.8
49.01 (max)	65.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.99 (min)	2.96
13.	2.97
16.	5.13
20.	10.6
25.	22.9
30.	41.6
35.	64.6
40.	87.8
46.60 (max)	111.

RMS % Error	Life Prediction Ratio Summary
21.06	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
22.70	0. .5 .8 1.25 2.

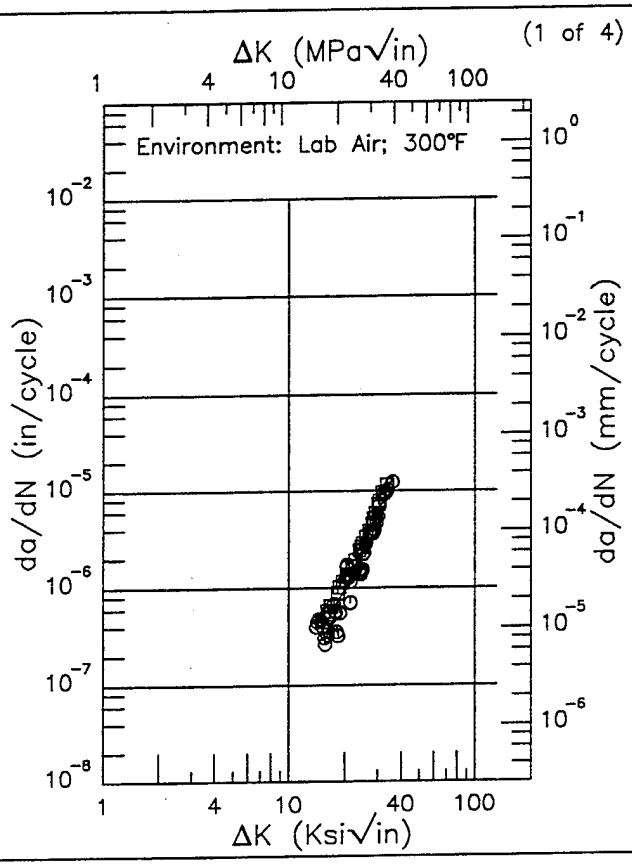
Figure 5.9.3.1.25 (Concluded)

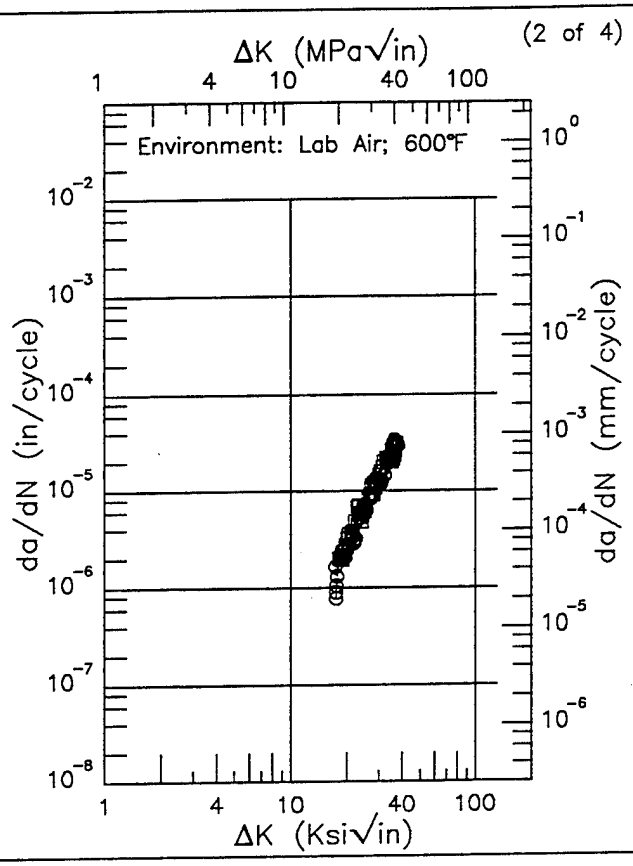
INCONEL 718

E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.25
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.253 in.
Specimen Width: 0.9 – 0.909 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.99 (min)	0.373
16.	0.465
20.	0.949
25.	2.53
30.	6.03
35.	12.1
35.84 (max)	13.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.33 (min)	1.36
20.	2.67
25.	6.83
30.	13.8
35.	24.3
38.01 (max)	32.8

RMS % Error 23.83

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 16.68

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

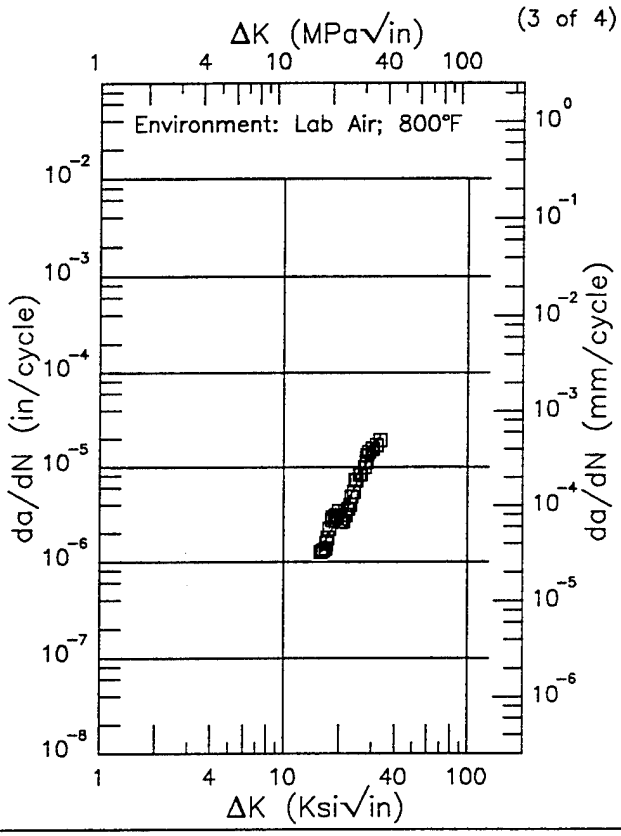
Figure 5.9.3.1.26

INCONEL 718 E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.25
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.253 in.
Specimen Width: 0.9 – 0.909 in.
Ref: GE005

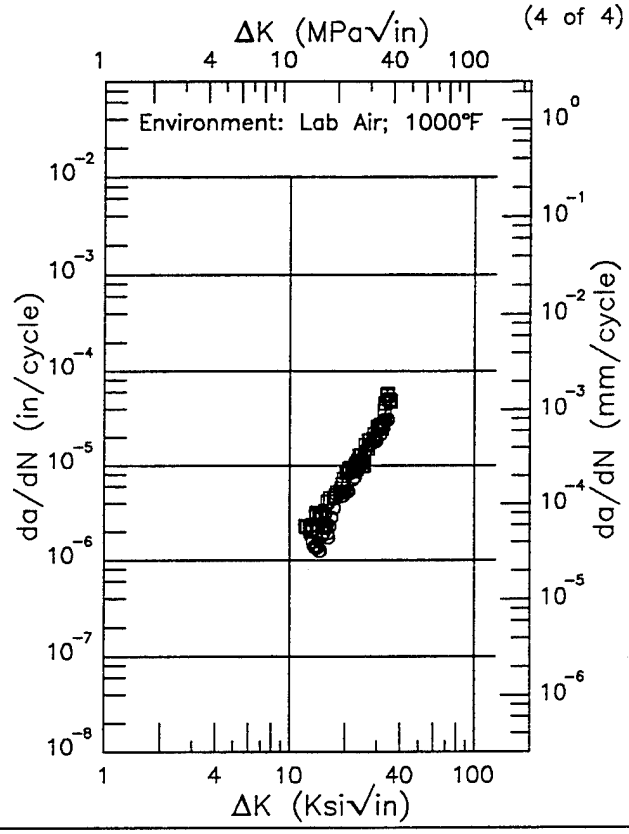
(3 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.78 (min)	1.36
16.	1.41
20.	2.91
25.	6.95
30.	14.4
33.30 (max)	21.3

RMS % Error	Life Prediction Ratio Summary
15.48	0. .5 .8 1.25 2.

(4 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.17 (min)	1.63
13.	1.80
16.	2.89
20.	5.80
25.	13.0
30.	25.5
35.	43.8
35.35 (max)	45.3

RMS % Error	Life Prediction Ratio Summary
22.77	0. .5 .8 1.25 2.

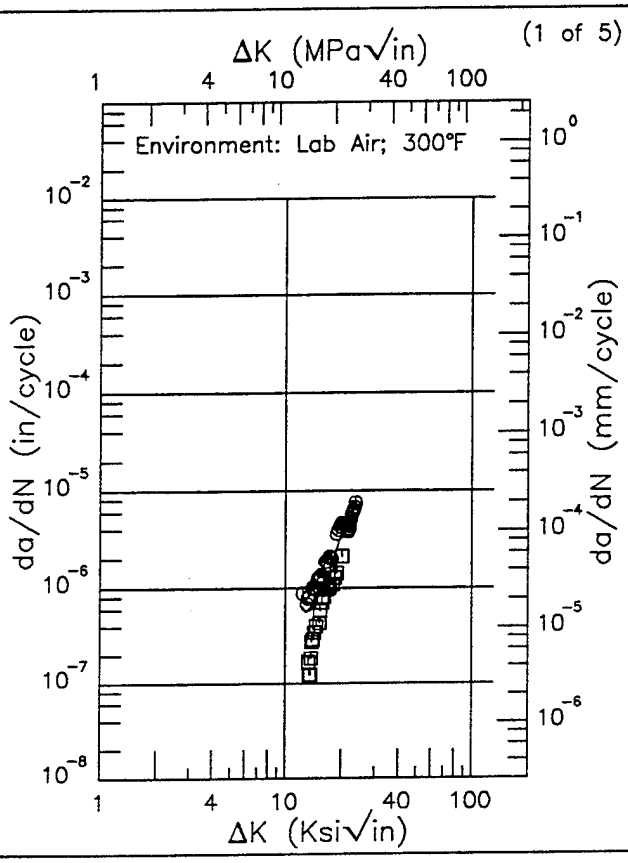
Figure 5.9.3.1.26 (Concluded)

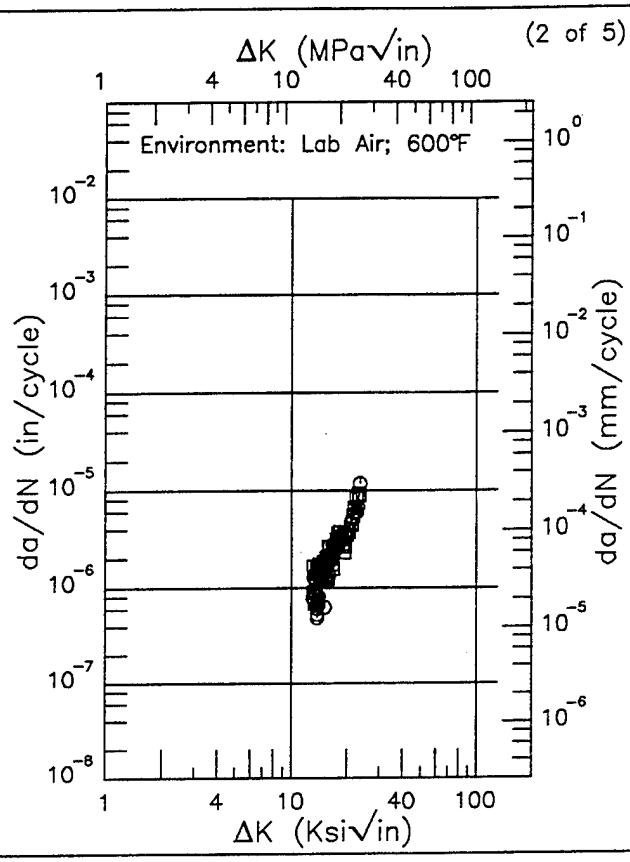
INCONEL 718

E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.54
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.255 in.
Specimen Width: 0.902 – 0.922 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.37 (min)	0.643
13.	0.555
16.	0.934
20.	3.59
23.59 (max)	5.83

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.93 (min)	1.08
13.	1.07
16.	1.97
20.	3.63
23.39 (max)	9.65

RMS % Error	Life Prediction Ratio Summary
41.56	0. .5 .8 1.25 2.

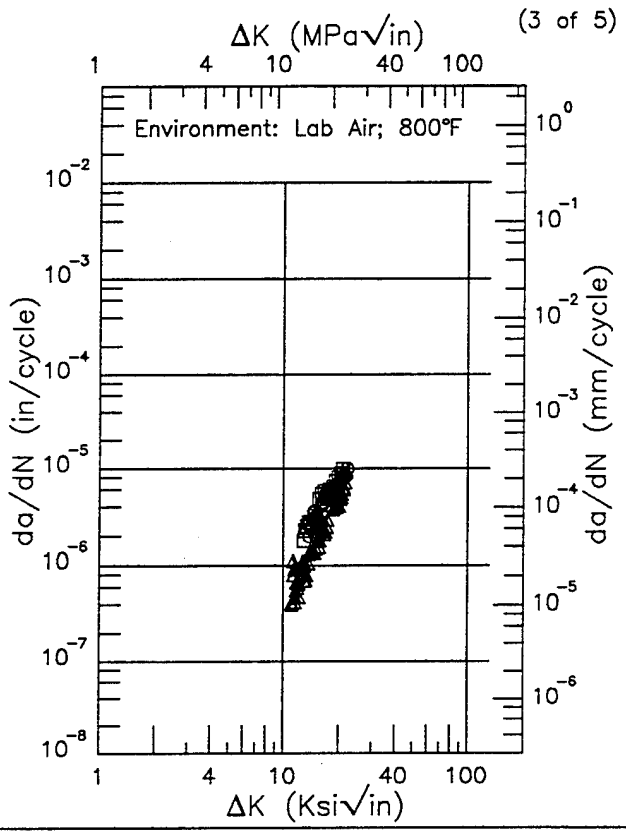
RMS % Error	Life Prediction Ratio Summary
23.62	0. .5 .8 1.25 2.

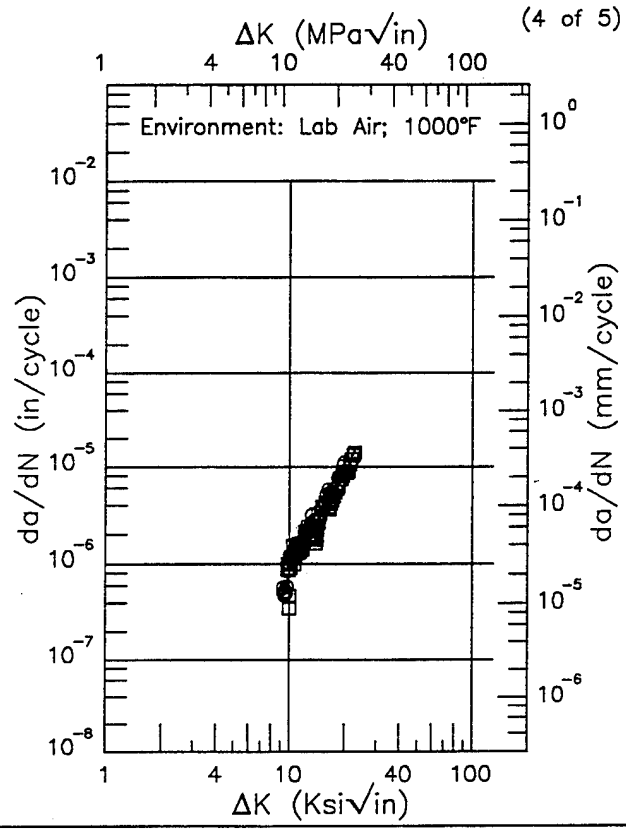
Figure 5.9.3.1.27

INCONEL 718 E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.54
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.255 in.
Specimen Width: 0.902 – 0.922 in.
Ref: GE005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.11 (min)	0.592
13.	1.14
16.	3.30
20.	5.78
21.92 (max)	9.00

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.26 (min)	0.485
10.	0.820
13.	2.22
16.	3.86
20.	8.98
22.64 (max)	12.6

RMS % Error	Life Prediction Ratio Summary
35.53	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
19.95	0. .5 .8 1.25 2.

Figure 5.9.3.1.27 (Continued)

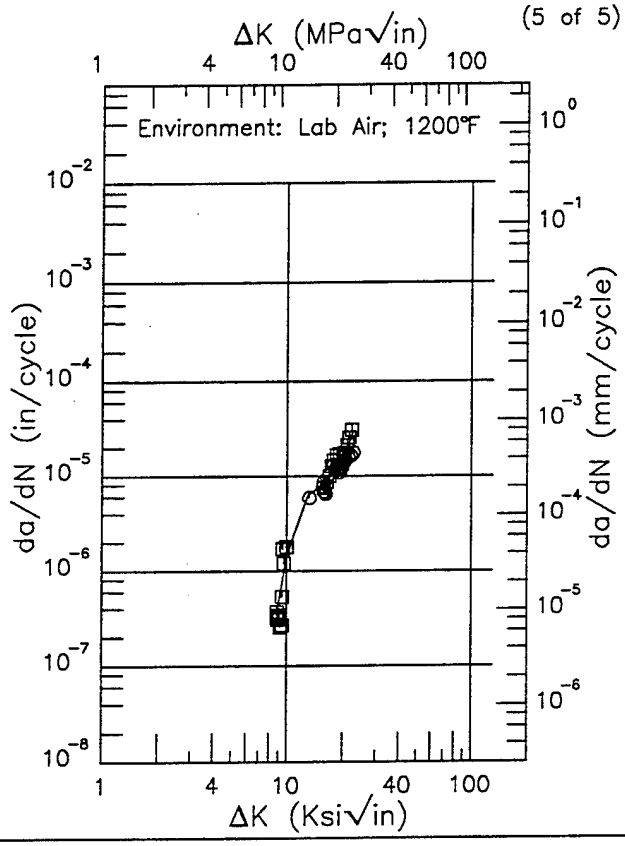
INCONEL 718

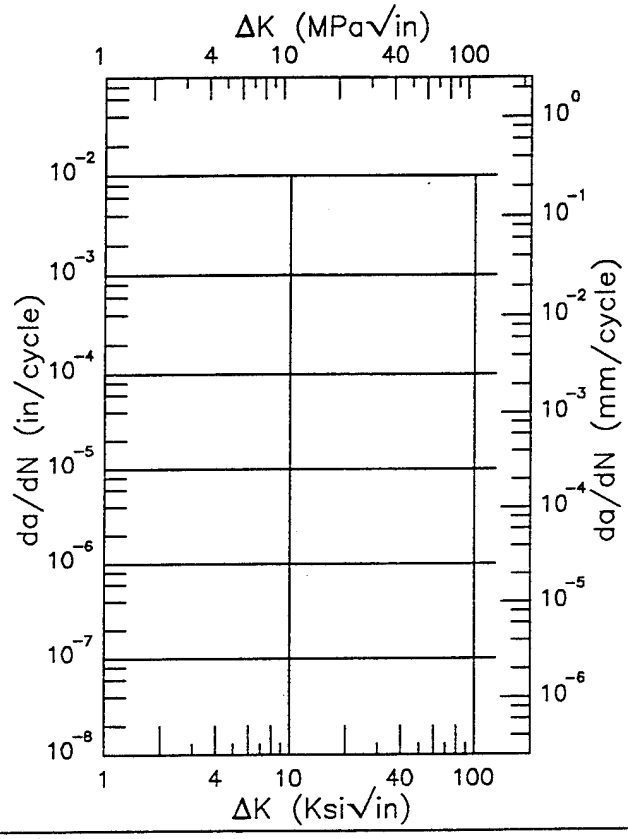
E

Condition/Ht: 1750F 1HR Q 1325F 8HR FC TO 1150F AT 100F/HR HOLD 8HR
Form: 1.13 – 1.3 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.54
Frequency: 0.3 Hz

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.255 in.
Specimen Width: 0.902 – 0.922 in.
Ref: GE005

(5 of 5)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.80 (min)	0.304
9.	0.424
10.	1.47
13.	6.28
16.	8.59
20.	14.4
22.63 (max)	29.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
30.20	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.27 (Concluded)

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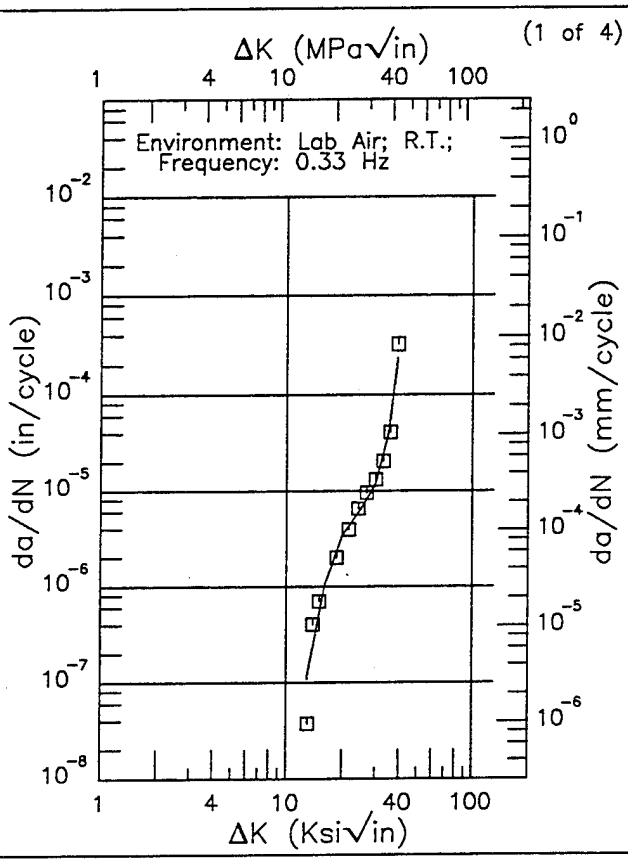
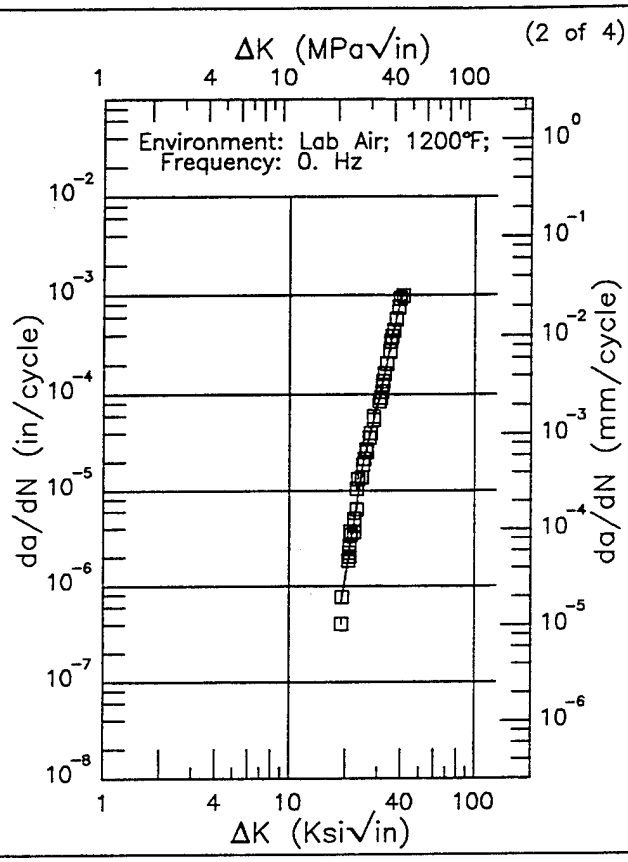
INCONEL 718

EF

Condition/Ht: 1760F 1HR WQ 1325F 8HRS
Form: 3.6 in. Disk
Specimen Type: CCP (max stress specified)
Orientation: C–R
Stress Ratio: 0.

Yield Strength: 171.6 ksi
Ult. Strength: 201.7 ksi
Specimen Thk: 0.08 in.
Specimen Width: 2 in.
Ref: GE008





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.93 (min)	0.108
13.	0.116
16.	1.01
20.	3.39
25.	6.49
30.	11.9
35.	41.2
39.18 (max)	236.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.03 (min)	0.685
20.	1.21
25.	20.1
30.	80.0
35.	311.
40.	916.
41.00 (max)	1009.

RMS % Error	Life Prediction Ratio Summary
38.40	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
18.18	0. .5 .8 1.25 2.

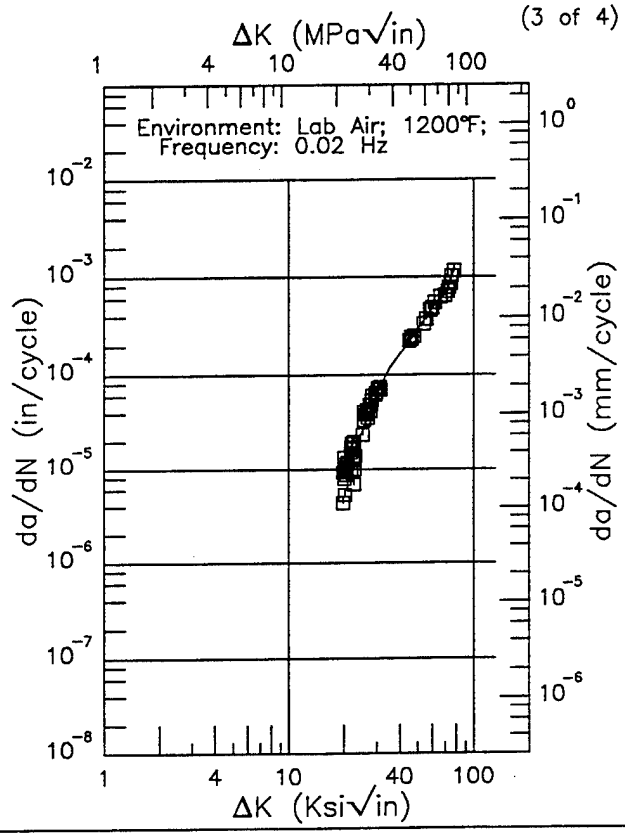
Figure 5.9.3.1.28

INCONEL 718 EF

Condition/Ht: 1760F 1HR WQ 1325F 8HRS
Form: 3.6 in. Disk
Specimen Type: CCP (max stress specified)
Orientation: C–R
Stress Ratio: 0.

Yield Strength: 171.6 ksi
Ult. Strength: 201.7 ksi
Specimen Thk: 0.08 in.
Specimen Width: 2 in.
Ref: GE008

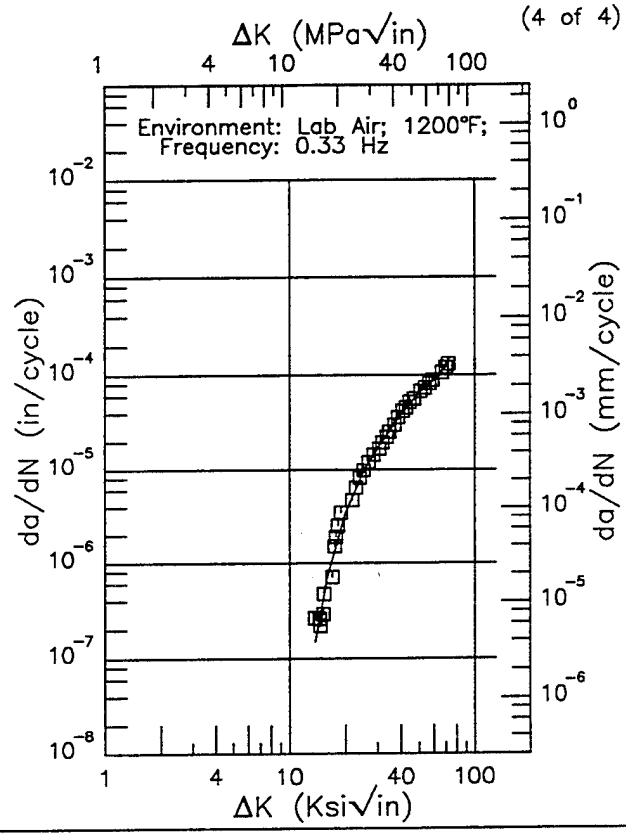
(3 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.60 (min)	8.25
20.	8.94
25.	25.6
30.	63.0
35.	116.
40.	167.
50.	287.
60.	489.
70.	679.
77.64 (max)	1132.

RMS % Error	Life Prediction Ratio Summary
20.58	0. .5 .8 1.25 2.

(4 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.68 (min)	0.148
16.	0.713
20.	3.42
25.	9.41
30.	17.0
35.	26.5
40.	38.6
50.	65.8
60.	89.3
70.	121.
71.33 (max)	127.

RMS % Error	Life Prediction Ratio Summary
20.50	0. .5 .8 1.25 2.

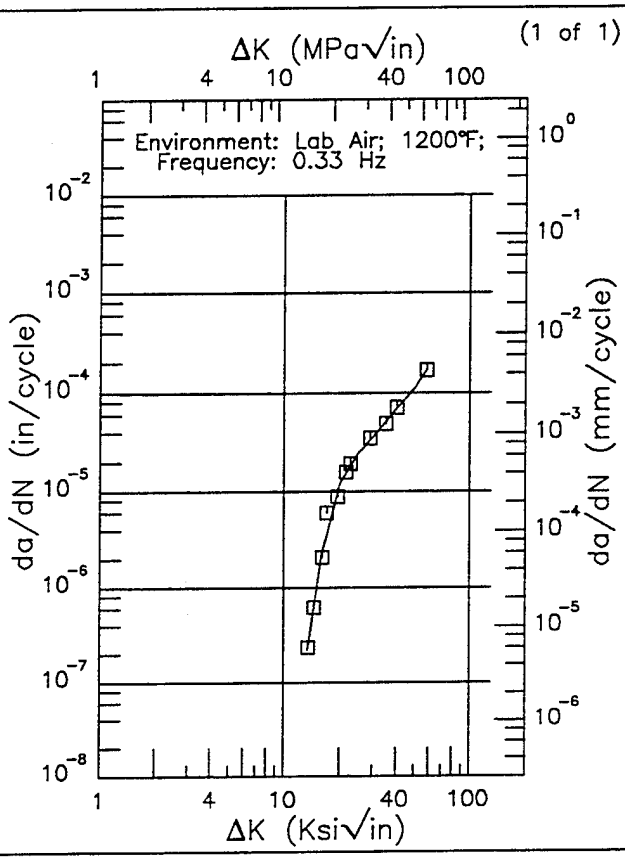
Figure 5.9.3.1.28 (Concluded)

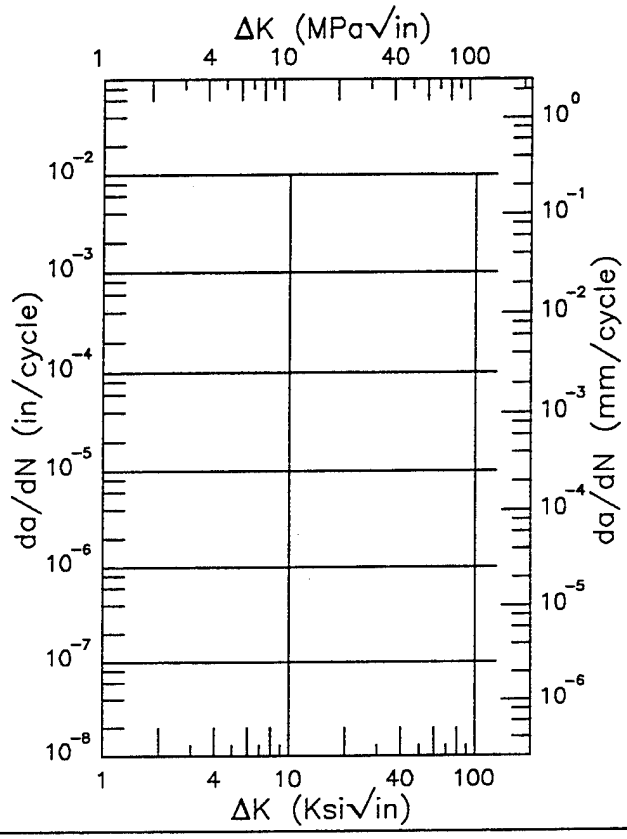
INCONEL 718

EF

Condition/Ht: 1760F 1HR WQ 1325F 8HRS
Form: 3.6 in. Disk
Specimen Type: CCP (max stress specified)
Orientation: C–R
Stress Ratio: 0.

Yield Strength: 171.6 ksi
Ult. Strength: 201.7 ksi
Specimen Thk: 0.25 in.
Specimen Width: 0.6 in.
Ref: GE008





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.48 (min)	0.223
16.	2.30
20.	12.0
25.	24.7
30.	35.7
35.	50.6
40.	68.7
50.	109.
58.25 (max)	166.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
20.72	0. .5 .8 1.25 2.

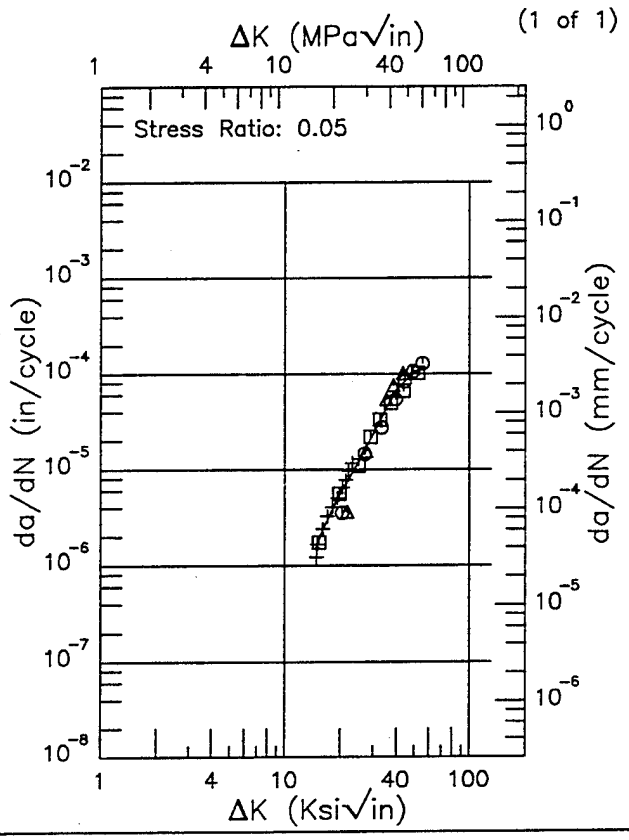
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

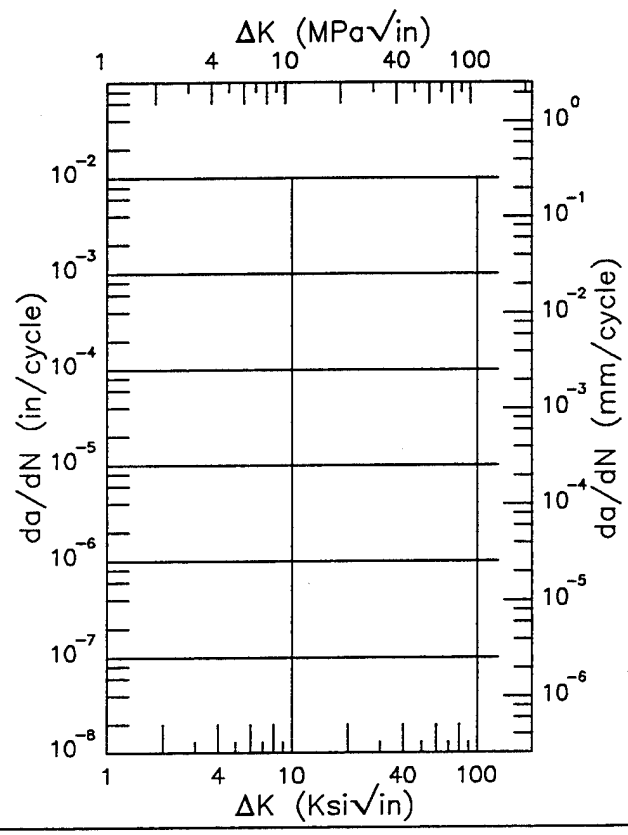
Figure 5.9.3.1.29

INCONEL 718 R

Condition/Ht: 1800F 1HR Q 1325F 8HRS FC TO 1150F HOLD 8HRS AC
Form: 4.67 in. Forging
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;1200°F

Yield Strength: 169.2 ksi
Ult. Strength:
Specimen Thk: 0.25 in.
Specimen Width: 0.6 in.
Ref: GE001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.80 (min)	1.52
16.	2.29
20.	5.69
25.	12.0
30.	23.2
35.	42.9
40.	67.9
50.	104.
55.00 (max)	117.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
18.29	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.30

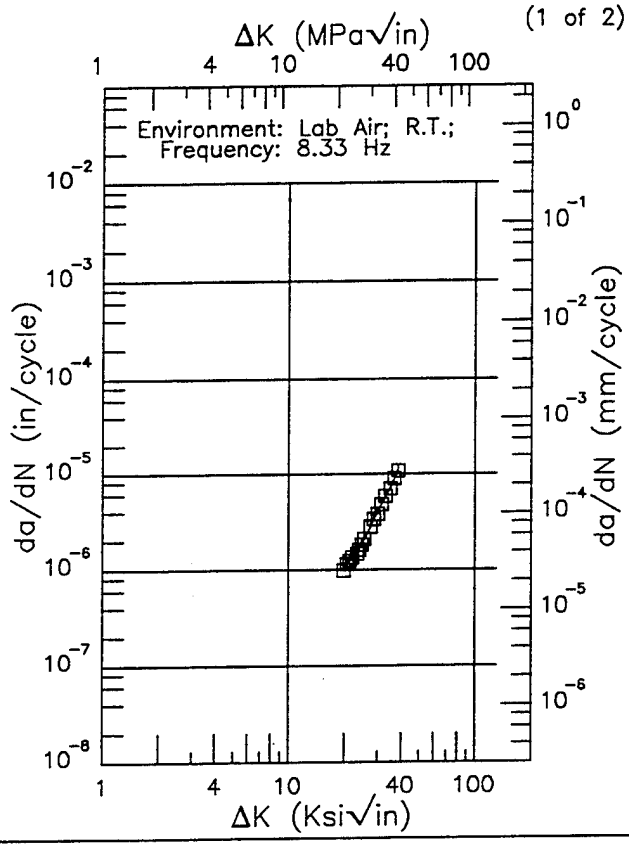
EF

INCONEL 718

Condition/Ht: 1950F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.05

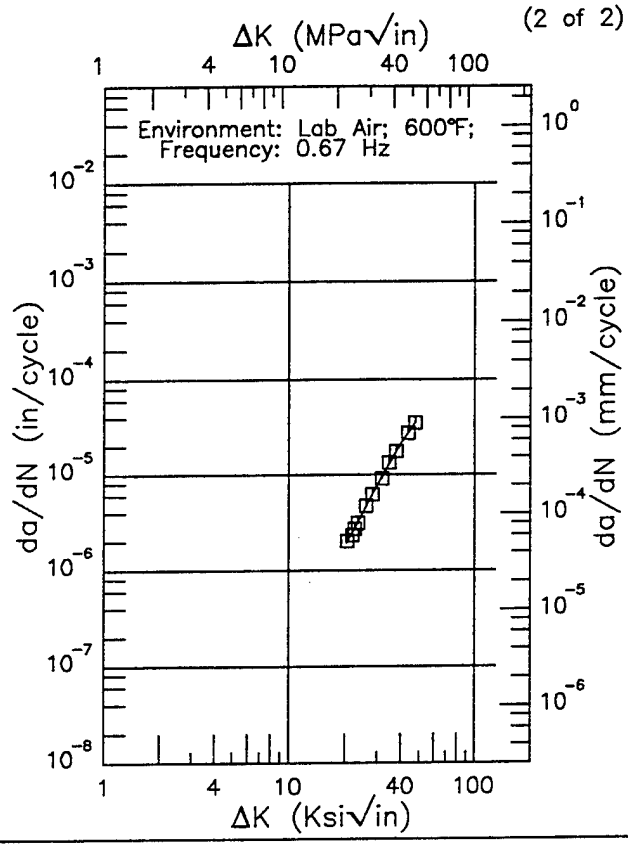
Yield Strength: 161.1 ksi
Ult. Strength: 198.2 ksi
Specimen Thk: 0.49 – 0.491 in.
Specimen Width: 1.992 – 1.997 in.
Ref: HD015

(1 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.66 (min)	0.998
20.	1.05
25.	1.93
30.	4.02
35.	7.24
38.40 (max)	10.8

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.46 (min)	1.92
25.	3.93
30.	7.66
35.	13.5
40.	21.1
47.52 (max)	34.8

RMS % Error	Life Prediction Ratio Summary
2.89	0. .5 .8 1.25 2.

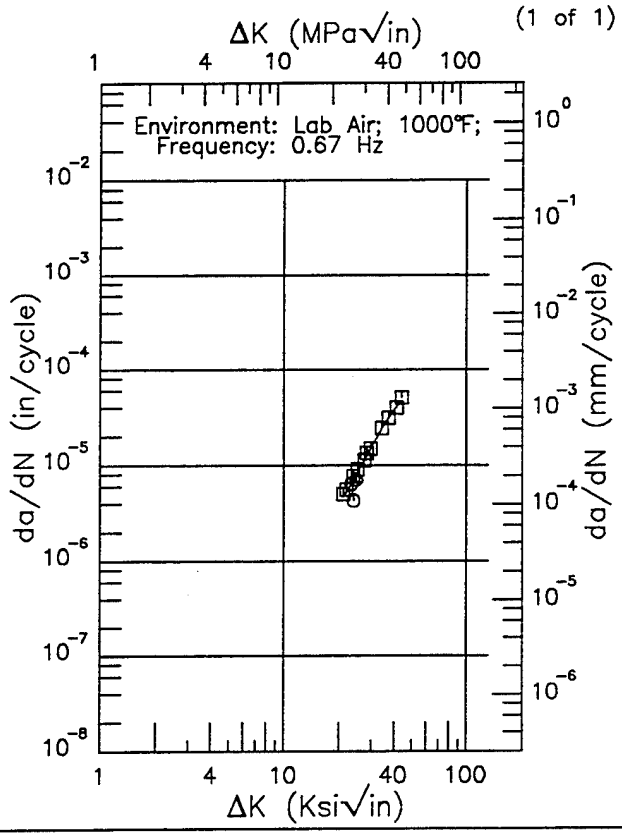
RMS % Error	Life Prediction Ratio Summary
2.68	0. .5 .8 1.25 2.

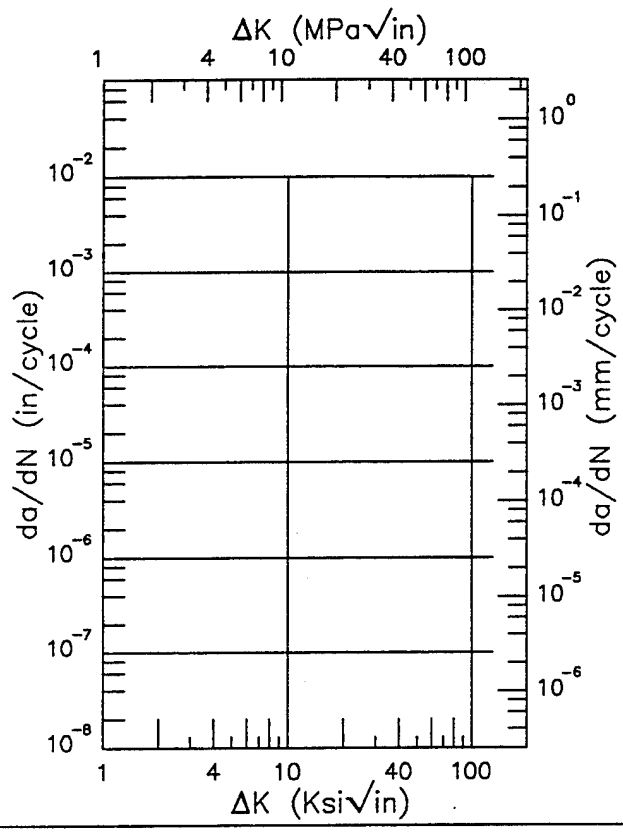
Figure 5.9.3.1.31

INCONEL 718 EF

Condition/Ht: 1950F AC 1325F
Form: 0.5 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.05

Yield Strength: 161.1 ksi
Ult. Strength: 198.2 ksi
Specimen Thk: 0.49 in.
Specimen Width: 1.996 – 1.998 in.
Ref: HD015





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.00 (min)	4.72
25.	8.12
30.	15.3
35.	25.8
40.	38.2
43.79 (max)	47.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error
11.81

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

Figure 5.9.3.1.32

R

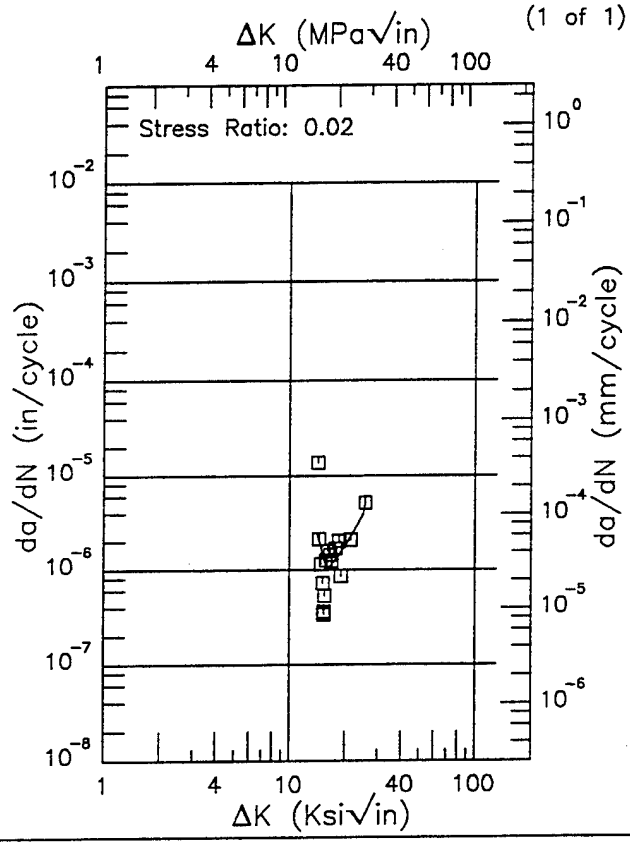
INCONEL 718

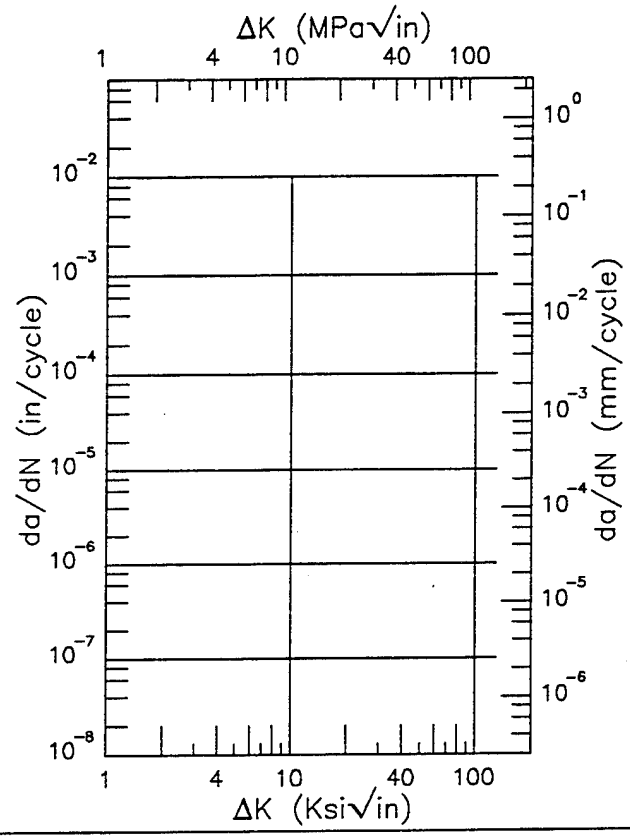
Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 20 Hz
Environment: LAB AIR; RT

Yield Strength: 180 ksi
Ult. Strength: 218 ksi
Specimen Thk: 0.187 in.
Specimen Width: 1.5 in.
Ref: MA016

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.12 (min)	2.41
16.	0.989
20.	1.75
25.	3.94
25.60 (max)	5.10

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

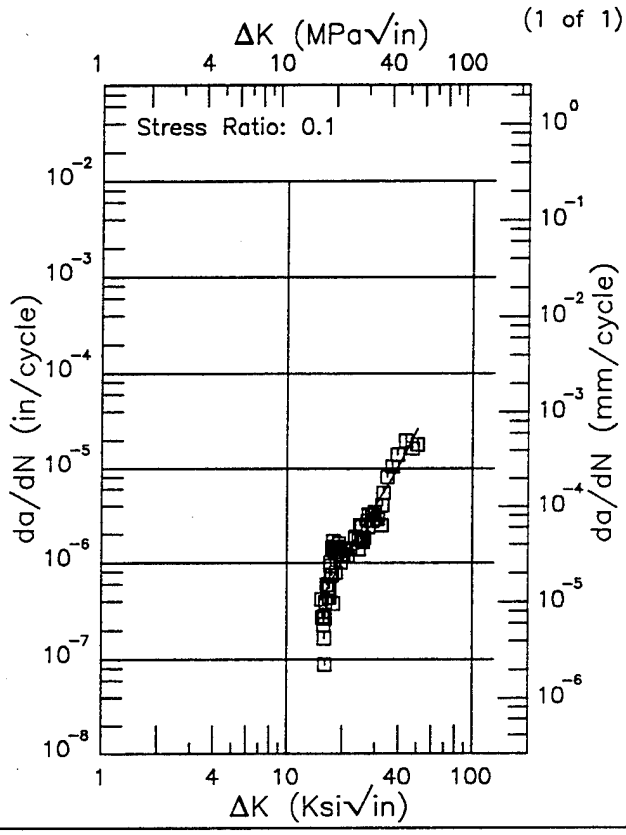
Figure 5.9.3.1.33

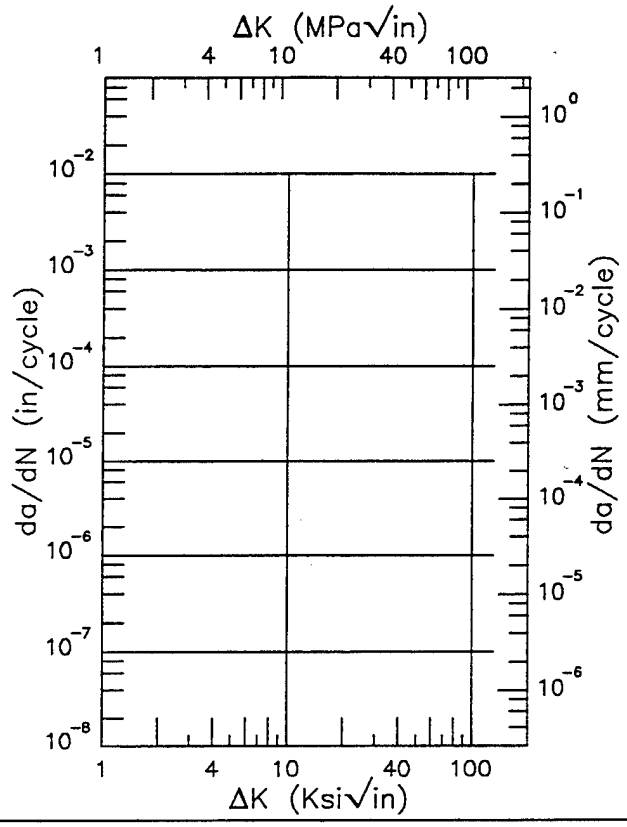
INCONEL 718 R

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: VACUUM; RT

Yield Strength: 180 ksi
Ult. Strength: 218 ksi
Specimen Thk: 0.187 in.
Specimen Width: 1.5 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.39 (min)	0.415
16.	0.477
20.	1.02
25.	2.15
30.	3.96
35.	6.73
40.	10.9
50.	25.7
50.21 (max)	26.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
45.99	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.34

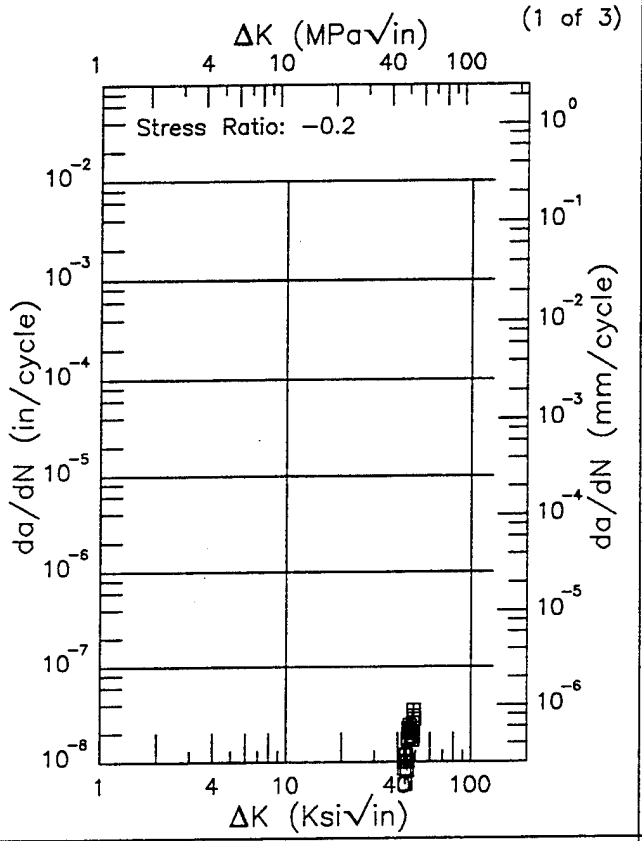
INCONEL 718

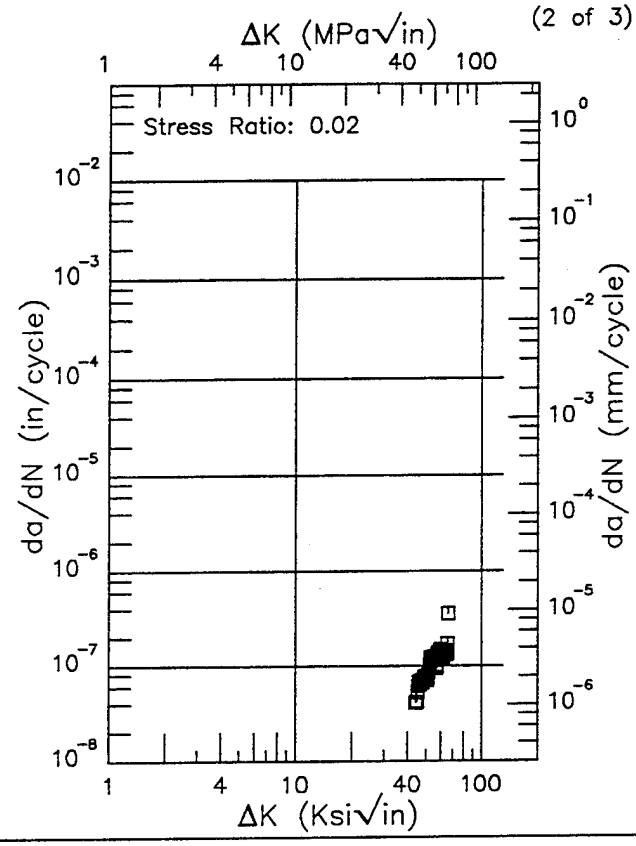
R

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 0. Hz
Environment: LAB AIR;1200°F

Yield Strength: 155 ksi
Ult. Strength: 178 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
43.03 (min)	0.0119
48.81 (max)	0.0367

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
44.06 (min)	0.0488
50.	0.0822
60.	0.124
65.89 (max)	0.182

RMS % Error	Life Prediction Ratio Summary
29.03	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
18.22	0. .5 .8 1.25 2.

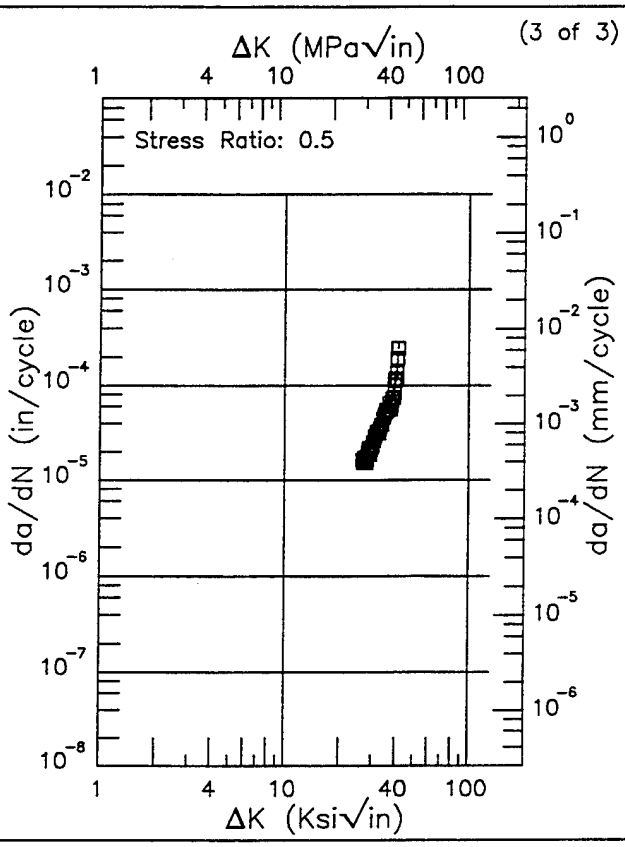
Figure 5.9.3.1.35

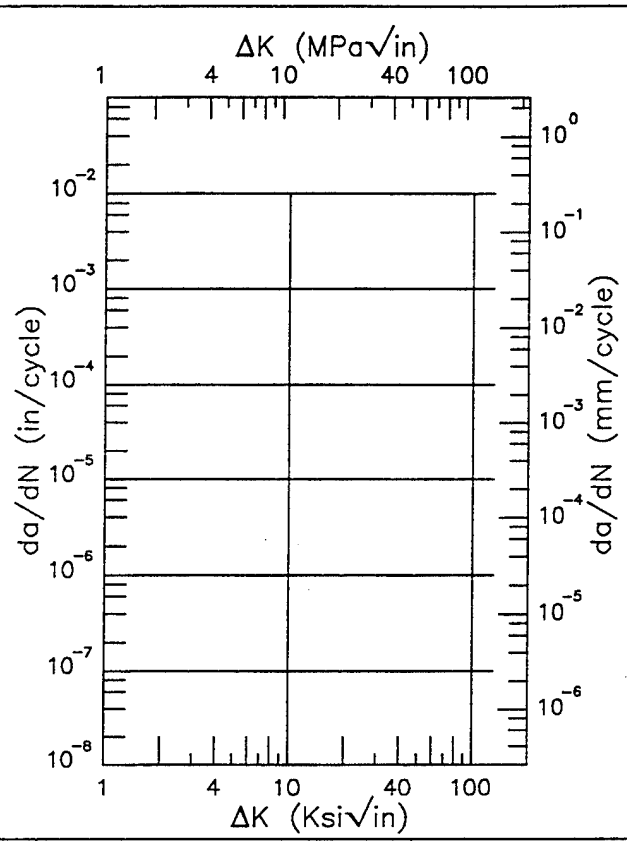
INCONEL 718 R

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 0. Hz
Environment: LAB AIR;1200°F

Yield Strength: 155 ksi
Ult. Strength: 178 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.35 (min)	15.7
30.	23.8
35.	47.5
40.	111.
41.09 (max)	222.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
9.83	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.35 (Concluded)

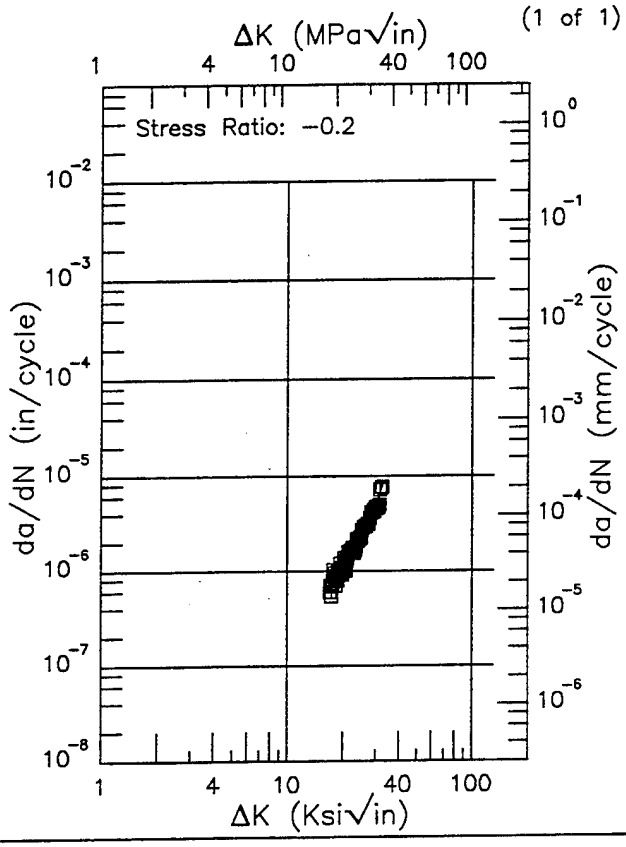
R

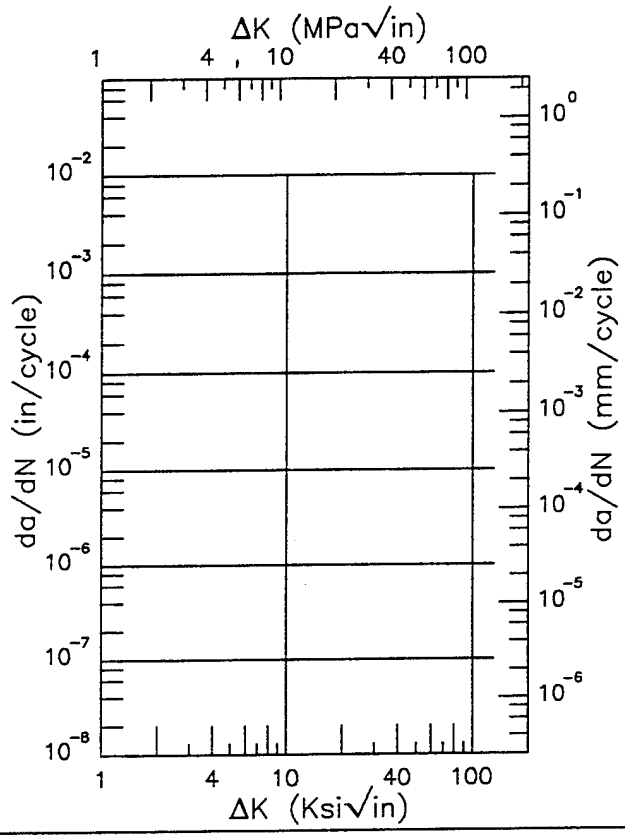
INCONEL 718

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 180 ksi
Ult. Strength: 218 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.93 (min)	0.646
20.	1.14
25.	2.48
30.	4.59
32.35 (max)	7.55

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
10.08	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.36

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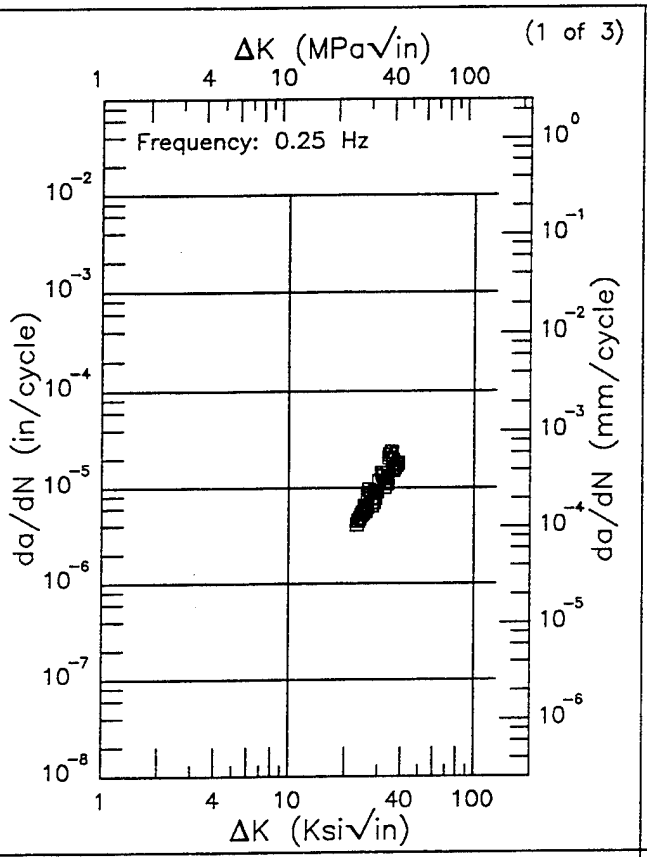
INCONEL 718

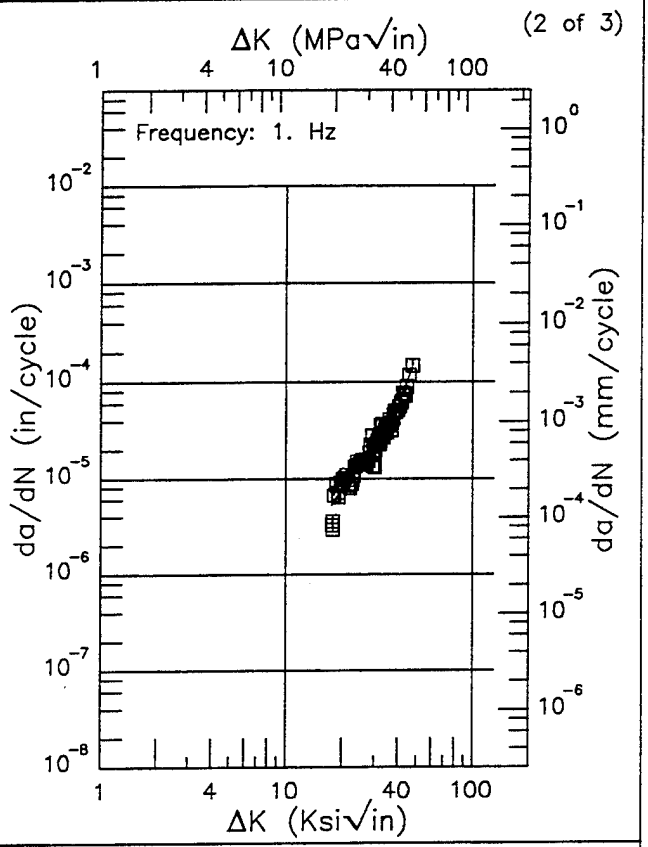
F

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.02
Environment: LAB AIR;1200°F

Yield Strength: 155 ksi
Ult. Strength: 178 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.08 (min)	3.97
25.	5.88
30.	9.69
35.	17.4
38.50 (max)	16.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.64 (min)	5.25
20.	8.09
25.	14.3
30.	21.7
35.	33.3
40.	54.9
47.54 (max)	140.

RMS % Error	Life Prediction Ratio Summary
16.07	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.64	0. .5 .8 1.25 2.

Figure 5.9.3.1.37

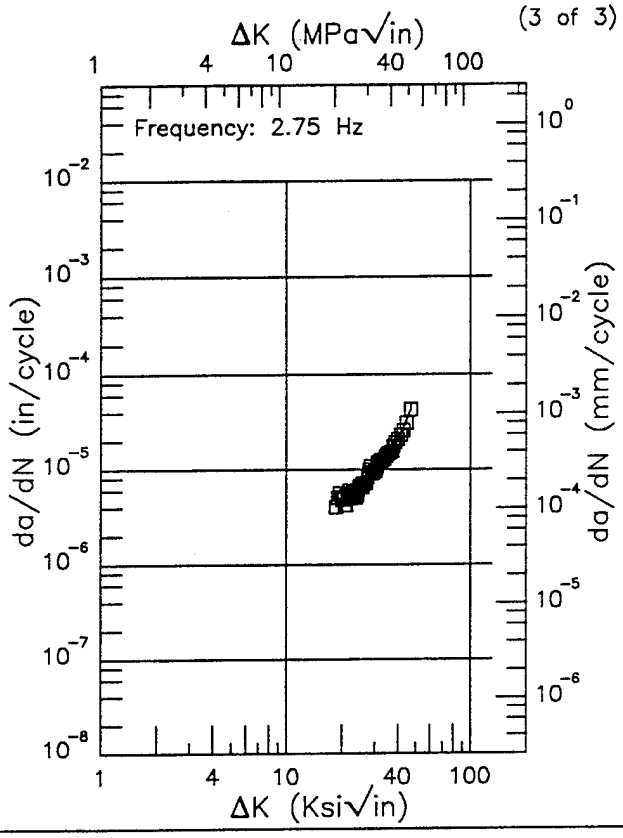
INCONEL 718 F

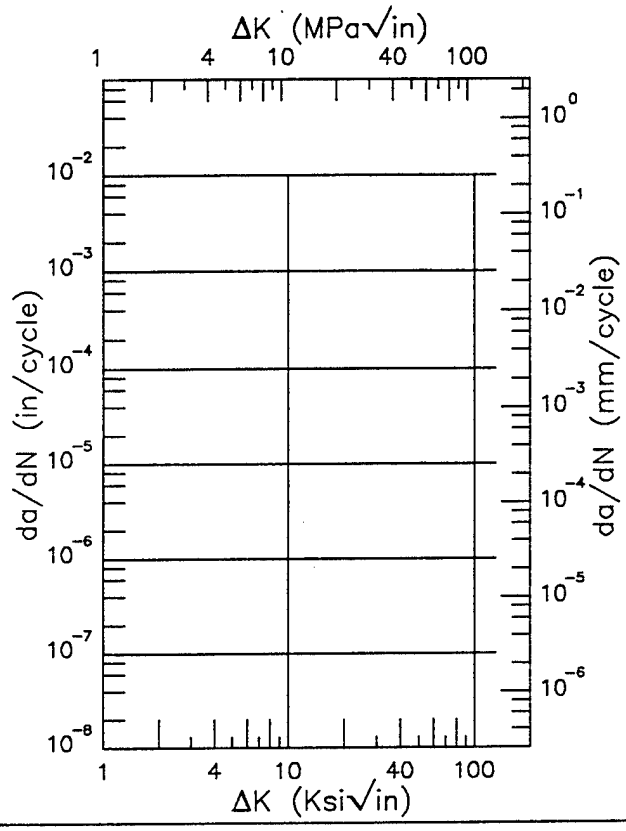
Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.02
Environment: LAB AIR;1200°F

Yield Strength: 155 ksi
Ult. Strength: 178 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.39 (min)	4.80
20.	4.82
25.	6.43
30.	10.1
35.	14.4
40.	20.1
46.96 (max)	42.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.97	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.37 (Concluded)

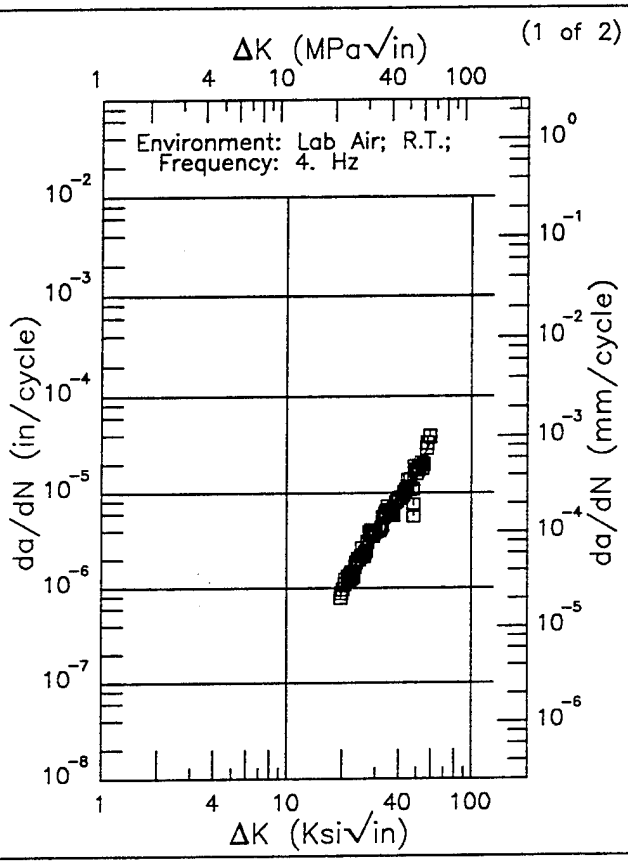
INCONEL 718

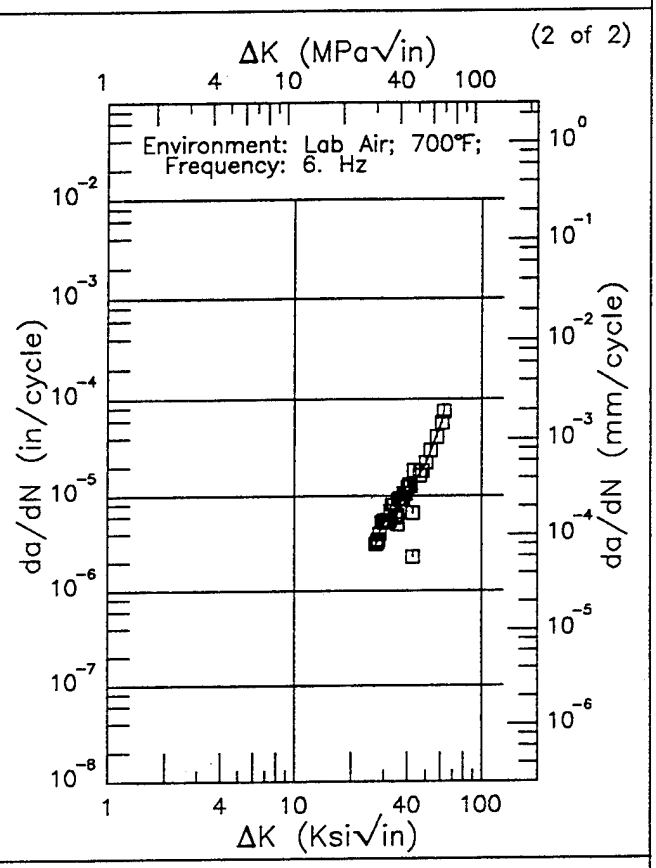
EF

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.02

Yield Strength: 167 – 180 ksi
Ult. Strength: 196 – 218 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.51 (min)	0.814
20.	0.918
25.	2.23
30.	3.85
35.	5.77
40.	8.22
50.	16.4
58.86 (max)	31.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.11 (min)	3.42
30.	4.99
35.	7.68
40.	10.6
50.	21.1
60.	53.6
62.56 (max)	71.4

RMS % Error	Life Prediction Ratio Summary
13.84	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
20.26	0. .5 .8 1.25 2.

Figure 5.9.3.1.38

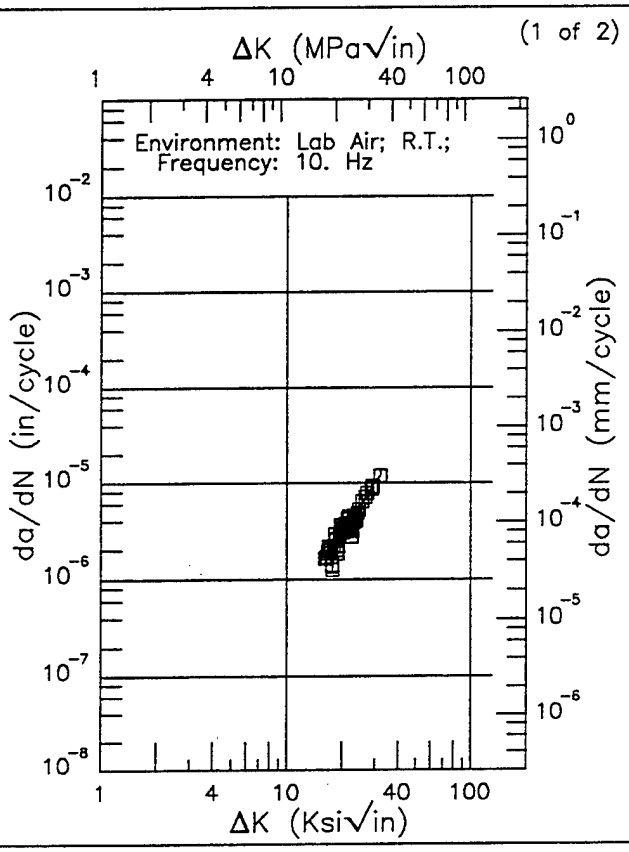
INCONEL 718

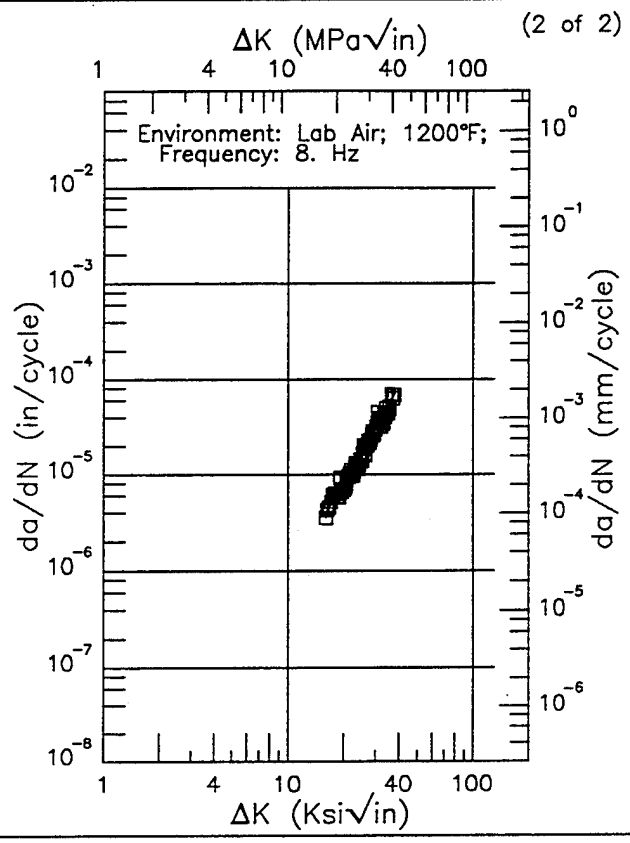
EF

Condition/Ht: ANNEALED 1800F 1 HR, AC, 1325F 8 HR, COOLED AT 100F PER HR TO 1150F, 1150F 8HR, AC

Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.5

Yield Strength: 155 – 180 ksi
Ult. Strength: 178 – 218 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.10 (min)	1.60
20.	2.97
25.	5.52
30.	10.3
31.91 (max)	11.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.99 (min)	3.88
16.	3.89
20.	7.67
25.	15.2
30.	30.9
35.	47.9
37.55 (max)	73.9

RMS % Error	Life Prediction Ratio Summary
15.41	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
10.71	0. .5 .8 1.25 2.

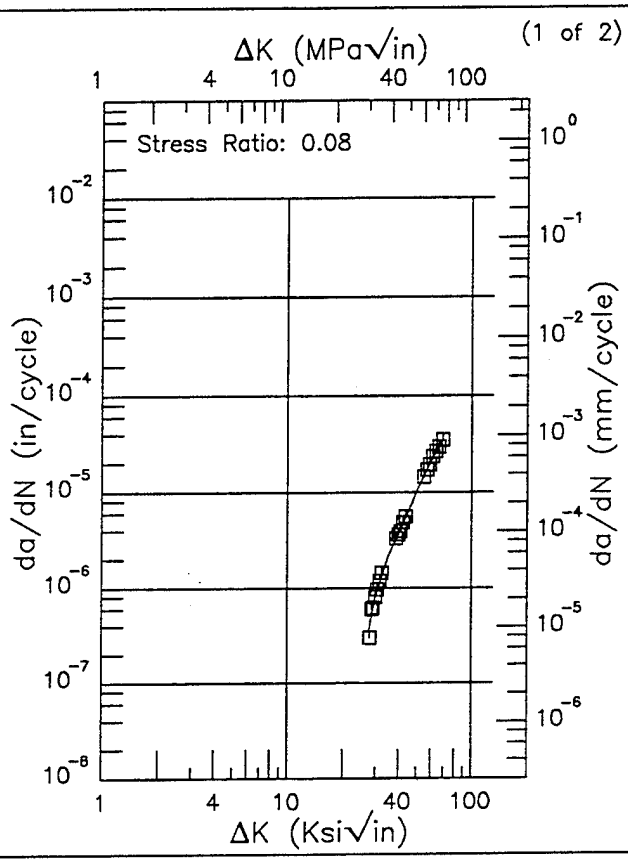
Figure 5.9.3.1.39

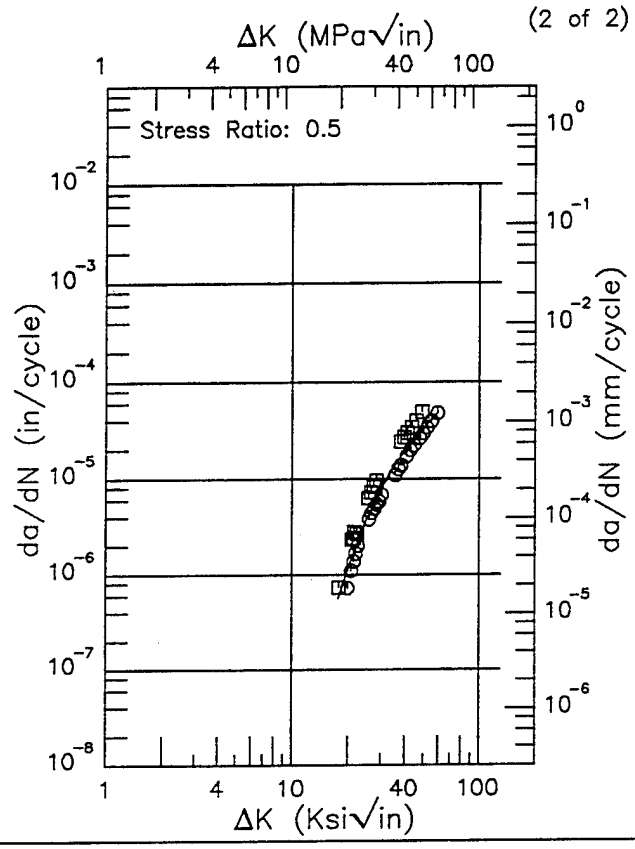
R

INCONEL 718

Condition/Ht: ST 1850F 1360 F 9HRS F/C 1175F
Form: 4 in. Forged Bar
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: L.H.A.; RT

Yield Strength: 160 ksi
Ult. Strength: 192 ksi
Specimen Thk: 0.5 in.
Specimen Width: 5.9 – 6 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.73 (min)	0.362
30.	0.834
35.	2.12
40.	3.71
50.	10.2
60.	21.1
69.11 (max)	34.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.85 (min)	0.570
20.	1.16
25.	3.69
30.	7.85
35.	13.3
40.	19.6
50.	33.4
59.27 (max)	47.1

RMS % Error	Life Prediction Ratio Summary
7.47	0. .5 .8 1.25 2.

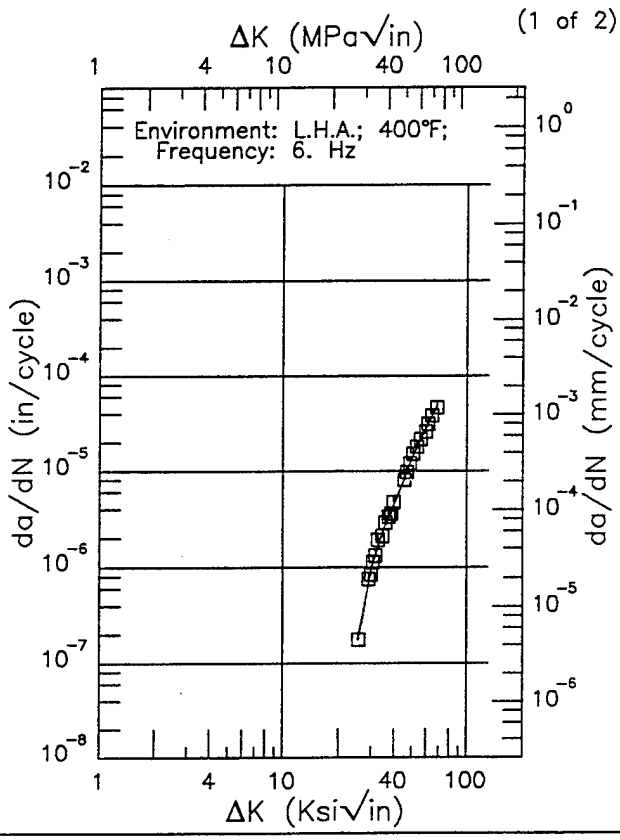
RMS % Error	Life Prediction Ratio Summary
33.80	0. .5 .8 1.25 2.

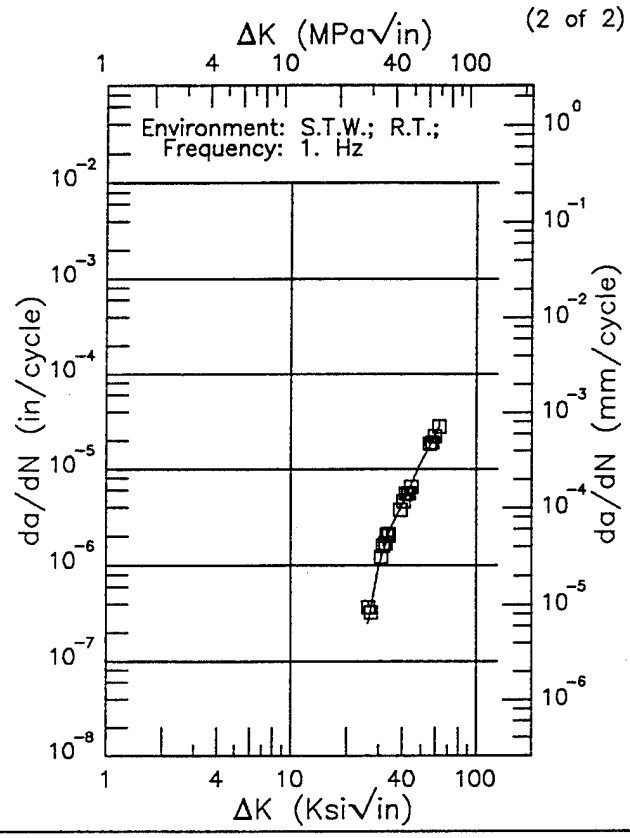
Figure 5.9.3.1.40

INCONEL 718 EF

Condition/Ht: ST 1850F 1360 F 9HRS F/C 1175F
Form: 4 in. Forged Bar
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08

Yield Strength: 160 ksi
Ult. Strength: 192 ksi
Specimen Thk: 0.5 in.
Specimen Width: 5.99 – 6 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.53 (min)	0.175
30.	0.973
35.	2.49
40.	4.59
50.	13.6
60.	28.7
68.07 (max)	47.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.20 (min)	0.251
30.	0.985
35.	2.56
40.	4.26
50.	11.9
60.	22.5
62.69 (max)	27.7

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
5.97	0. .5 .8 1.25 2.	12.61	0. .5 .8 1.25 2.

Figure 5.9.3.1.41

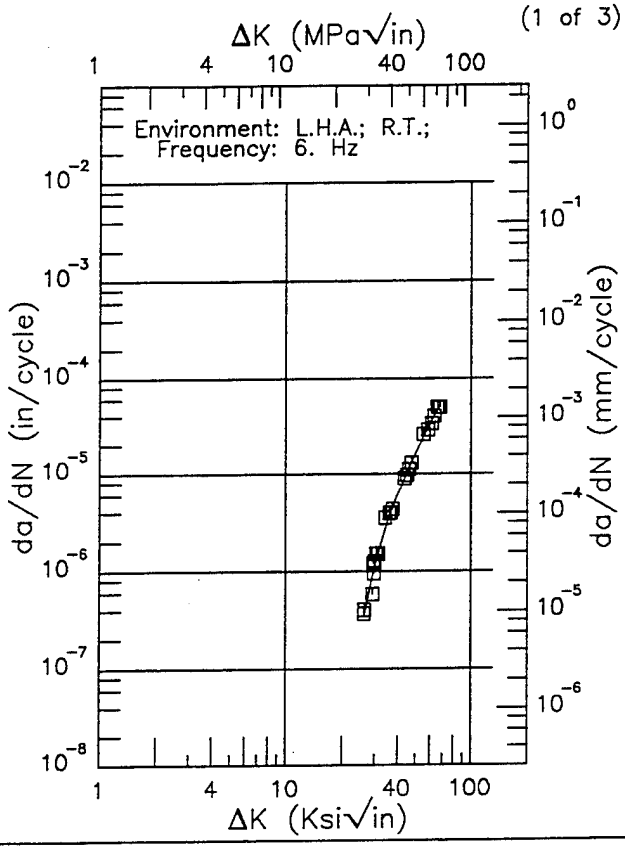
EF

INCONEL 718

Condition/Ht: ST 1850F 1360 F 9HRS F/C 1175F
Form: 4 in. Forged Bar
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08

Yield Strength: 160 ksi
Ult. Strength: 192 ksi
Specimen Thk: 0.5 – 0.51 in.
Specimen Width: 7.39 – 7.4 in.
Ref: 88579

(1 of 3)



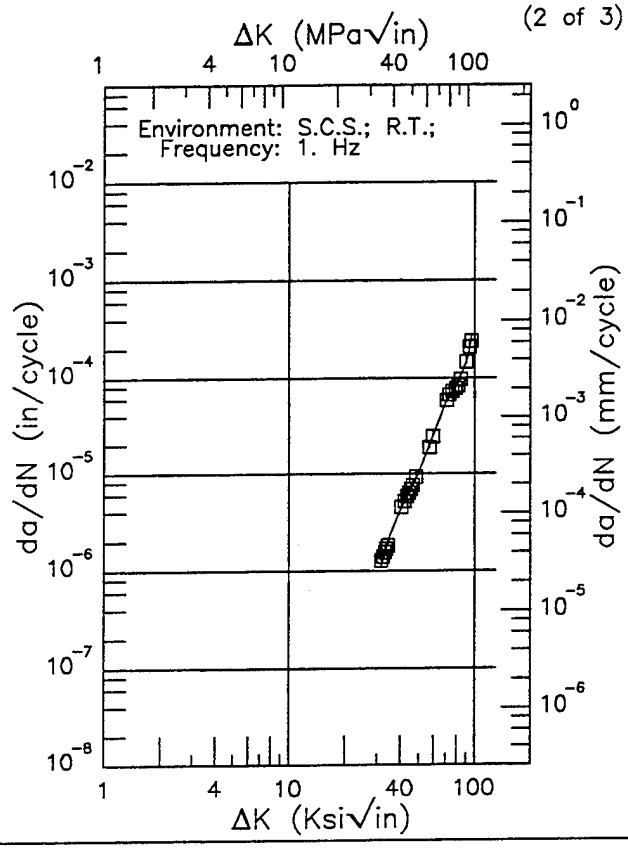
ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.21 (min)	0.339
30.	1.13
35.	3.15
40.	6.22
50.	16.1
60.	33.5
67.39 (max)	52.1

RMS % Error 13.51

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

(2 of 3)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
31.51 (min)	1.13
35.	2.21
40.	4.19
50.	10.2
60.	25.5
70.	55.1
80.	84.2
90.	143.
95.99 (max)	268.

RMS % Error 5.30

Life Prediction Ratio Summary

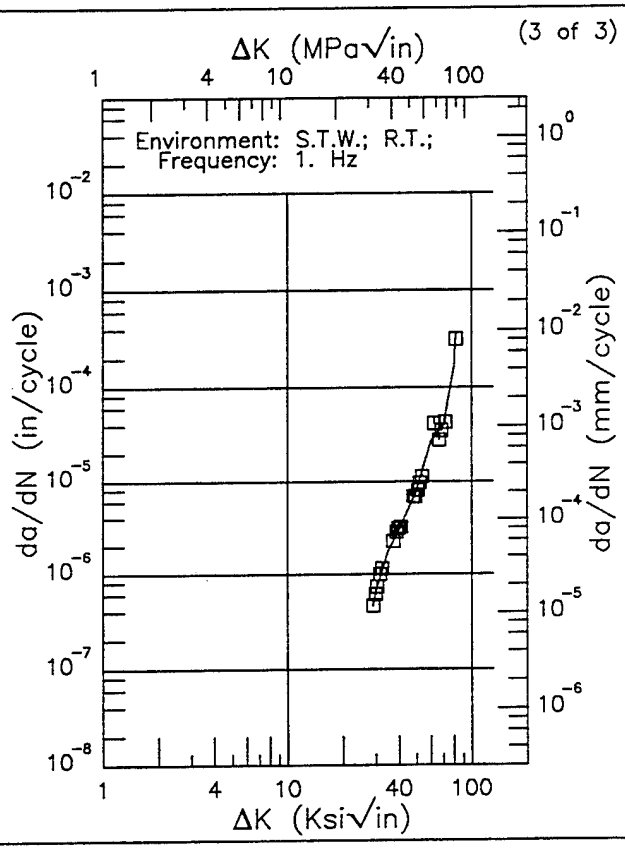
0. .5 .8 1.25 2.

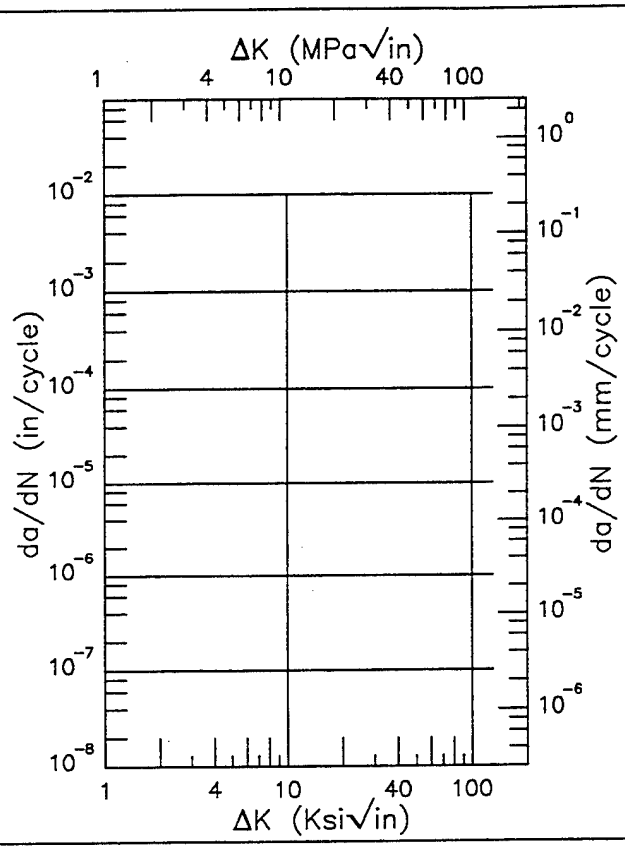
Figure 5.9.3.1.42

INCONEL 718 EF

Condition/Ht: ST 1850F 1360 F 9HRS F/C 1175F
Form: 4 in. Forged Bar
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08

Yield Strength: 160 ksi
Ult. Strength: 192 ksi
Specimen Thk: 0.5 – 0.51 in.
Specimen Width: 7.39 – 7.4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
28.93 (min)	0.457
30.	0.655
35.	1.80
40.	3.01
50.	8.23
60.	27.1
70.	39.8
80.	165.
81.34 (max)	316.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
12.70	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.9.3.1.42 (Concluded)

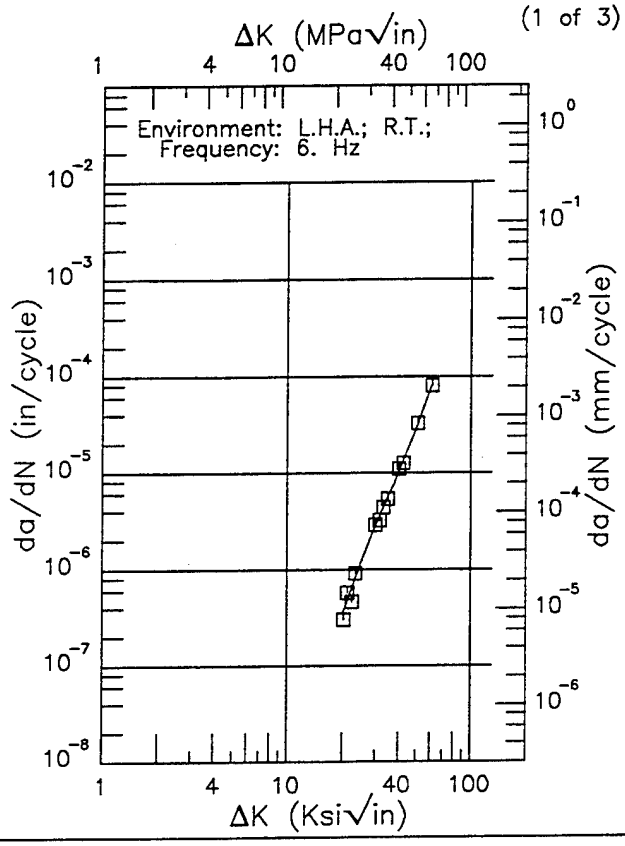
INCONEL 718

EF

Condition/Ht: ST 1850F 1360 F 9HRS F/C 1175F
Form: 4 in. Forged Bar
Specimen Type: CT
Orientation: S-L
Stress Ratio: 0.08

Yield Strength: 160 ksi
Ult. Strength: 192 ksi
Specimen Thk: 1 in.
Specimen Width: 3.77 in.
Ref: 88579

(1 of 3)



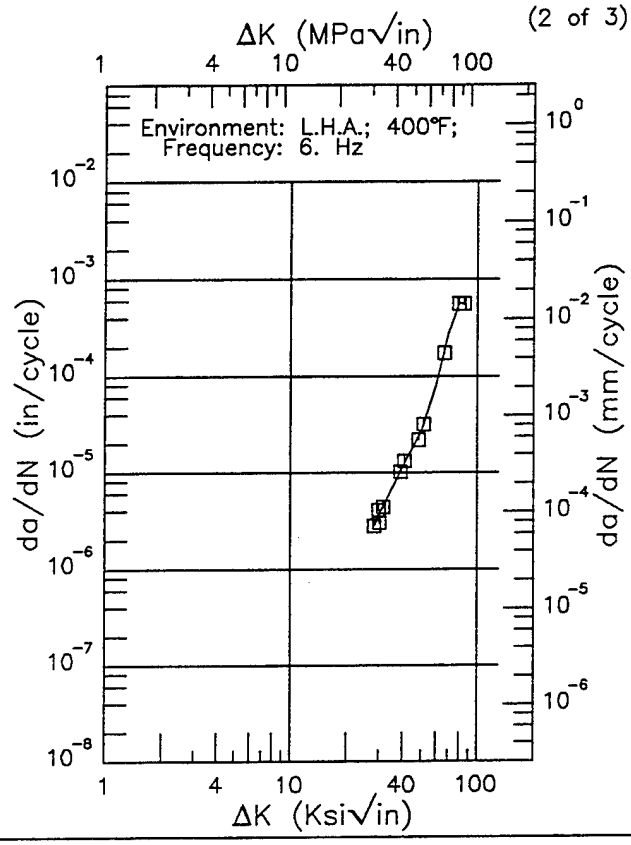
ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.07 (min)	0.356
25.	1.18
30.	2.82
35.	5.62
40.	10.1
50.	28.6
60.	74.5
61.11 (max)	82.7

RMS % Error 12.82

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

(2 of 3)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
28.21 (min)	2.81
30.	3.58
35.	6.71
40.	11.4
50.	26.9
60.	80.1
70.	273.
80.	565.
84.76 (max)	550.

RMS % Error 7.63

Life Prediction Ratio Summary

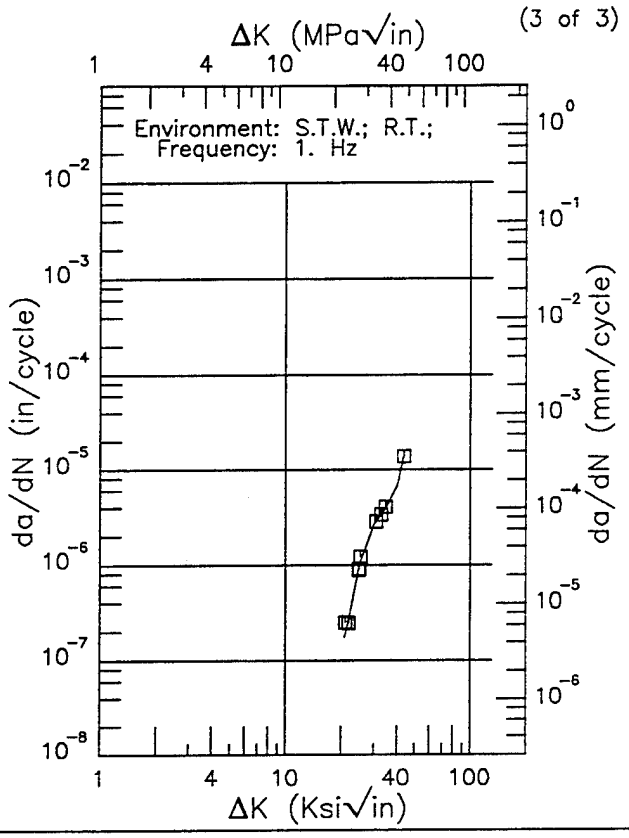
0. .5 .8 1.25 2.

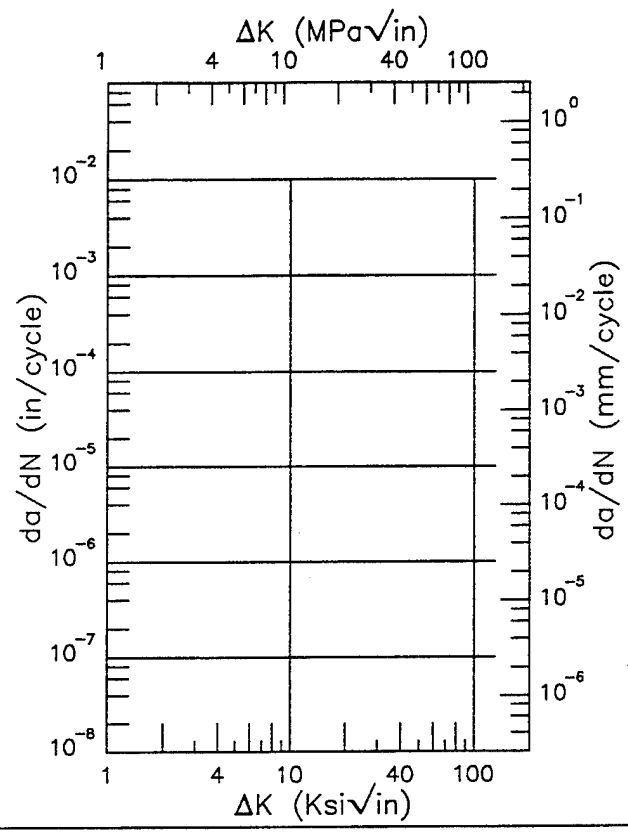
Figure 5.9.3.1.43

INCONEL 718 EF

Condition/Ht: ST 1850F 1360 F 9HRS F/C 1175F
Form: 4 in. Forged Bar
Specimen Type: CT
Orientation: S-L
Stress Ratio: 0.08

Yield Strength: 160 ksi
Ult. Strength: 192 ksi
Specimen Thk: 1 in.
Specimen Width: 3.77 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.92 (min)	0.176
25.	1.00
30.	2.63
35.	4.01
40.	6.82
43.46 (max)	13.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 14.37

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

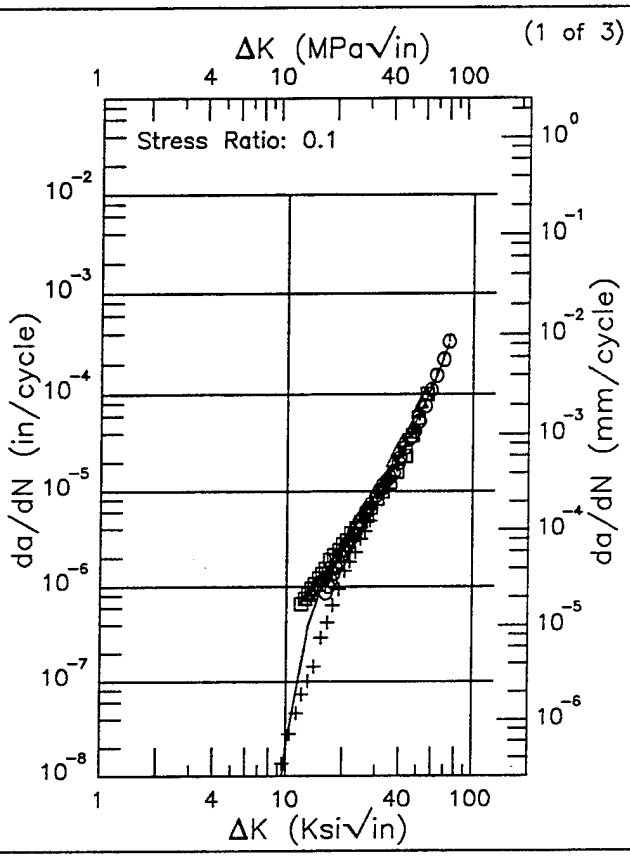
Figure 5.9.3.1.43 (Concluded)

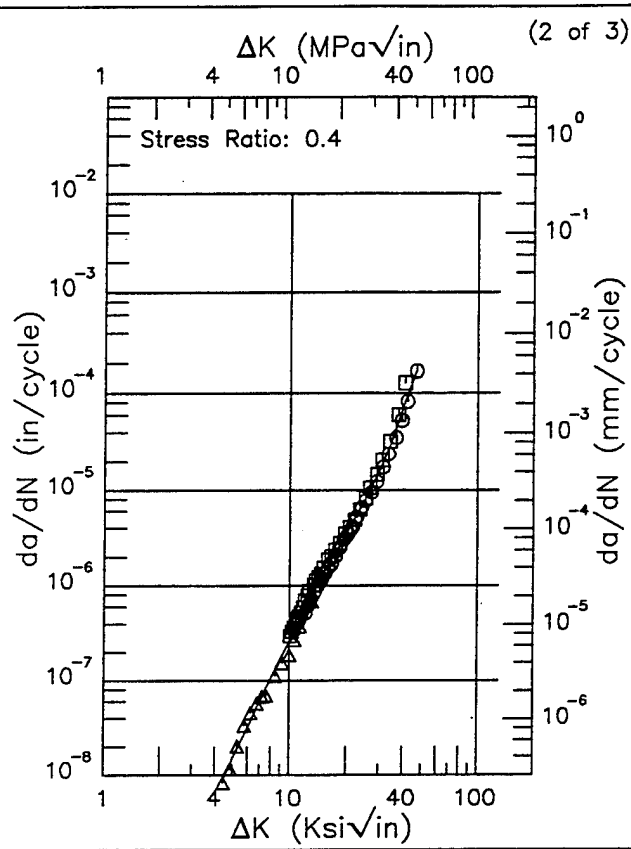
INCONEL 718

R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 15 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 161.2 – 177.4 ksi
Ult. Strength:
Specimen Thk: 0.244 – 0.254 in.
Specimen Width: 2.002 – 2.005 in.
Ref: DA006;DA007



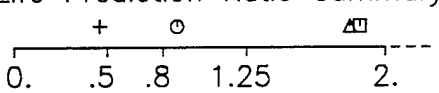


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.50 (min)	0.00991
10.	0.0218
13.	0.381
16.	1.24
20.	2.42
25.	4.11
30.	7.59
35.	14.2
40.	24.5
50.	56.4
60.	121.
70.	252.
73.51 (max)	313.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.45 (min)	0.00926
5.	0.0149
6.	0.0318
7.	0.0605
8.	0.105
9.	0.171
10.	0.263
13.	0.739
16.	1.60
20.	3.51
25.	7.75
30.	15.7
35.	32.5
40.	71.5
46.73 (max)	163.

RMS % Error 55.89

Life Prediction Ratio Summary



RMS % Error 14.60

Life Prediction Ratio Summary

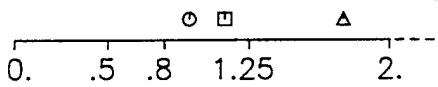
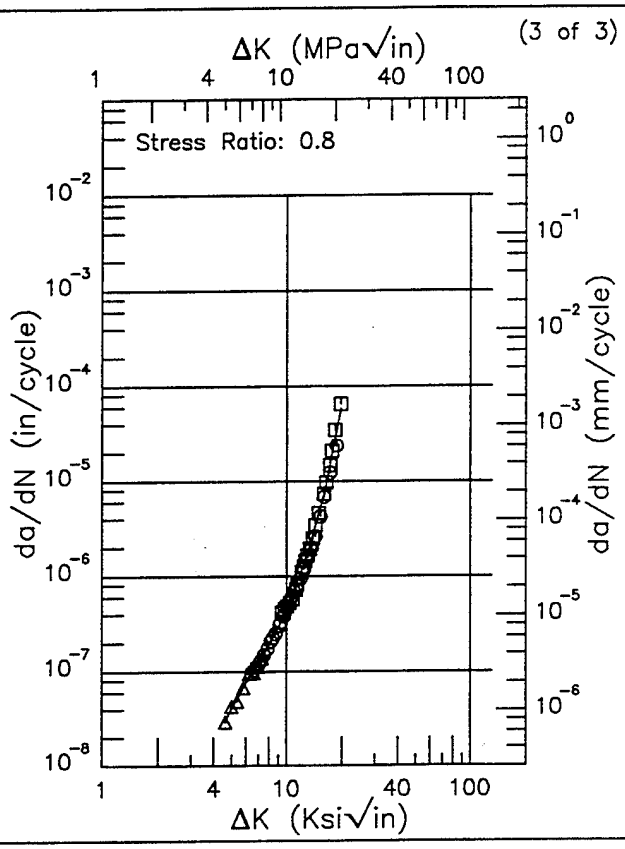


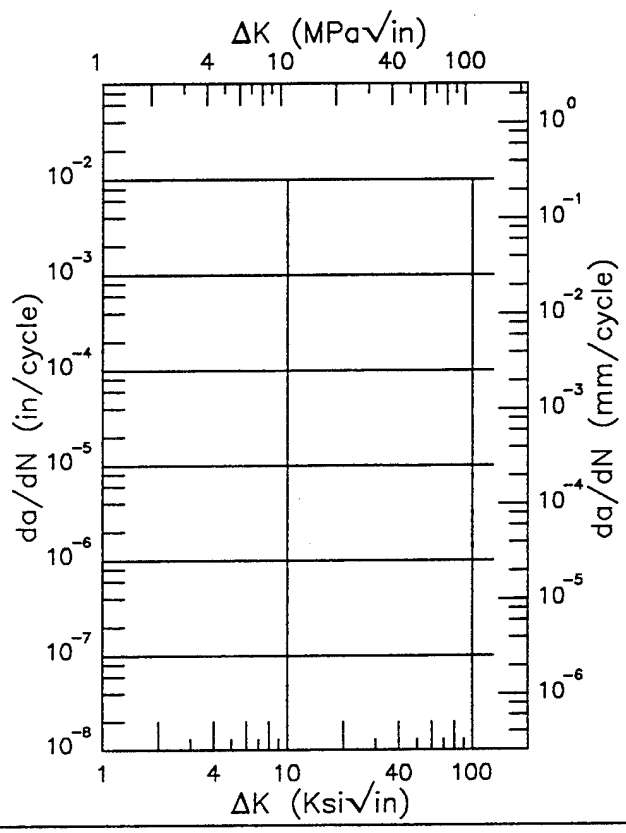
Figure 5.9.3.1.44

INCONEL 718 R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 15 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 161.2 – 177.4 ksi
Ult. Strength:
Specimen Thk: 0.244 – 0.254 in.
Specimen Width: 2.002 – 2.005 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.59 (min)	0.0294
5.	0.0410
6.	0.0755
7.	0.122
8.	0.189
9.	0.290
10.	0.449
13.	1.67
16.	7.56
19.57 (max)	58.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 9.02

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

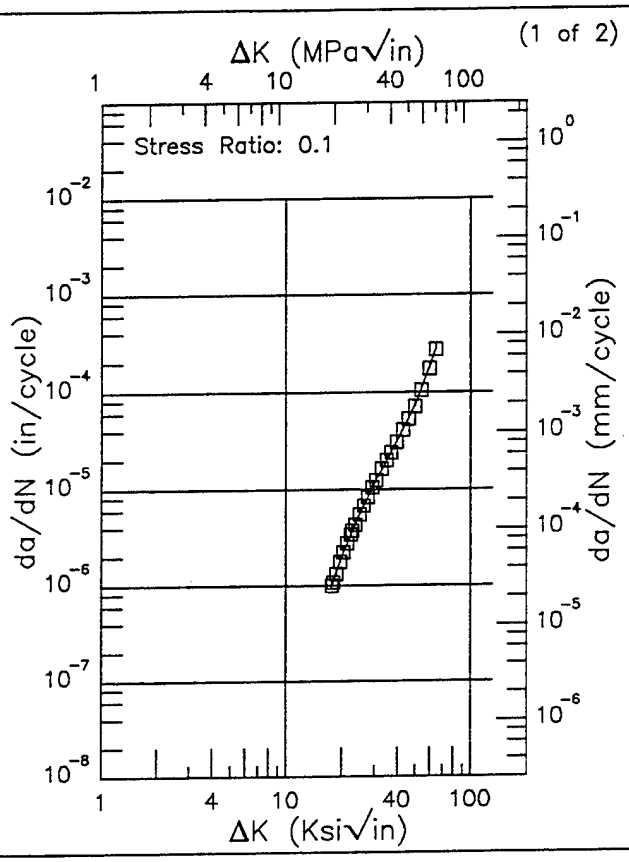
Figure 5.9.3.1.44 (Concluded)

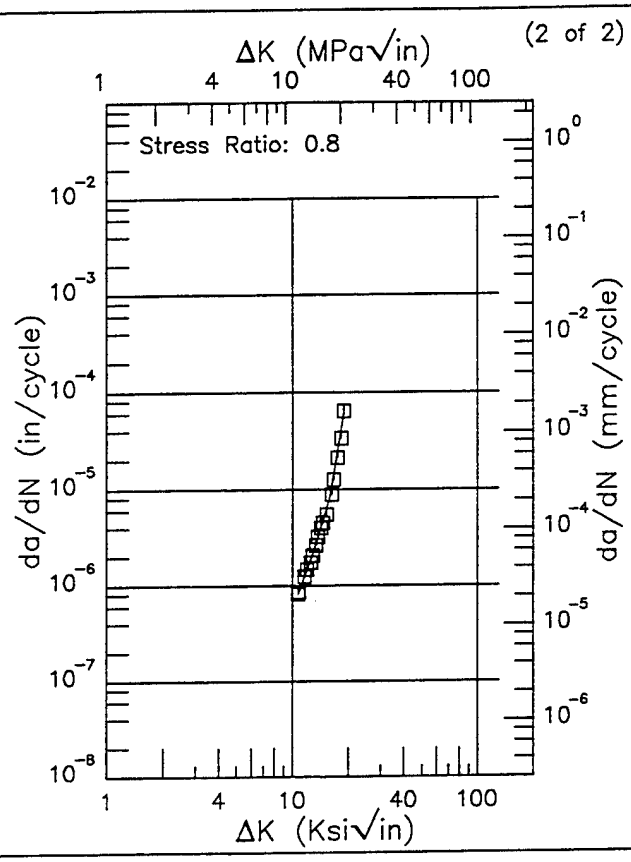
INCONEL 718

R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: DIST WATER; RT

Yield Strength: 161.2 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.25 in.
Specimen Width: 2.002 – 2.005 in.
Ref: DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.55 (min)	0.964
20.	2.00
25.	5.62
30.	11.5
35.	20.0
40.	31.8
50.	73.6
60.	183.
64.41 (max)	267.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.73 (min)	0.820
13.	2.28
16.	8.42
18.89 (max)	61.0

RMS % Error	Life Prediction Ratio Summary
1.83	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
6.15	0. .5 .8 1.25 2.

Figure 5.9.3.1.45

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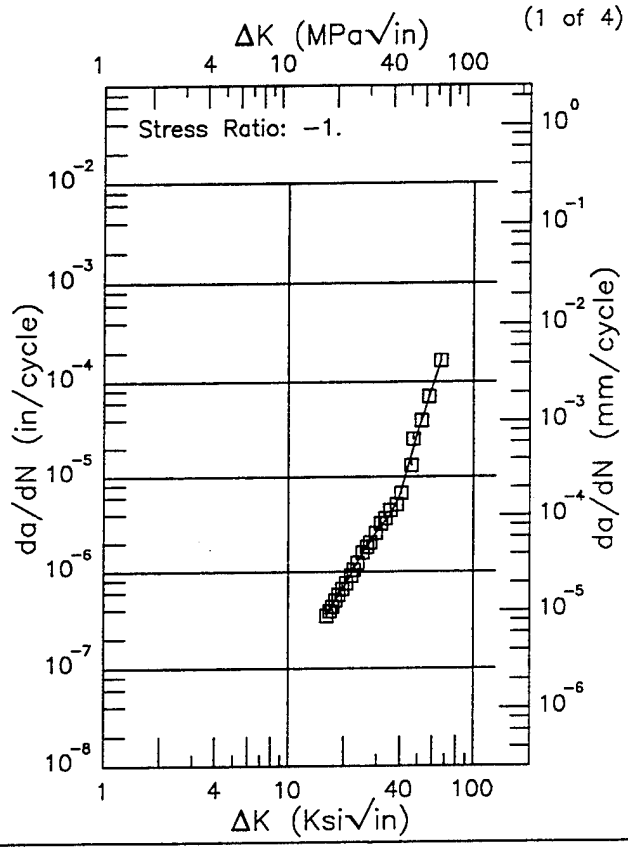
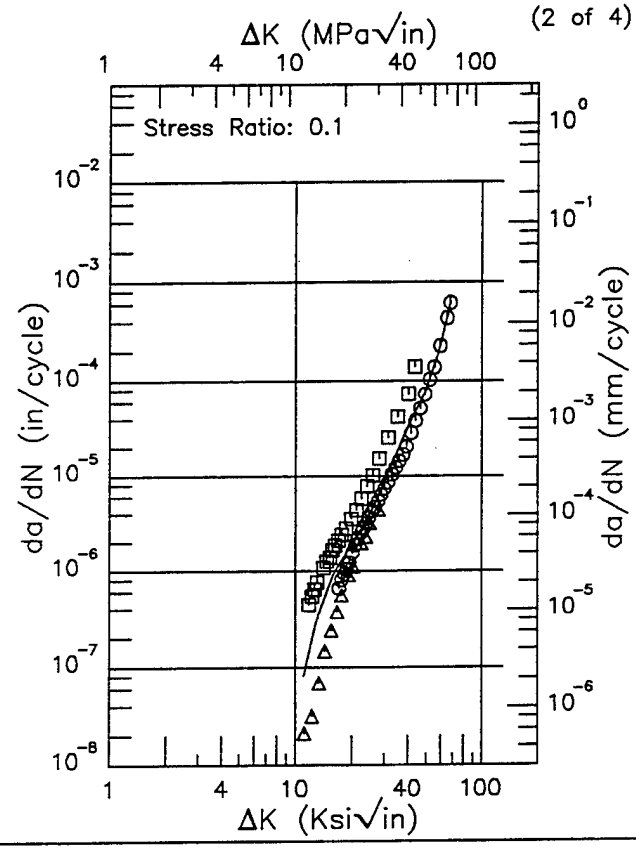
INCONEL 718

R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 5 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 155.4 – 169. ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.254 in.
Specimen Width: 2.001 – 2.007 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.01 (min)	0.360
20.	0.686
25.	1.54
30.	2.64
35.	3.87
40.	6.47
50.	29.8
60.	86.9
66.61 (max)	165.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.12 (min)	0.0823
13.	0.304
16.	0.919
20.	1.94
25.	3.94
30.	8.68
35.	18.2
40.	32.9
50.	82.1
60.	241.
67.33 (max)	613.

RMS % Error	Life Prediction Ratio Summary
7.49	0. .5 .8 1.25 2.

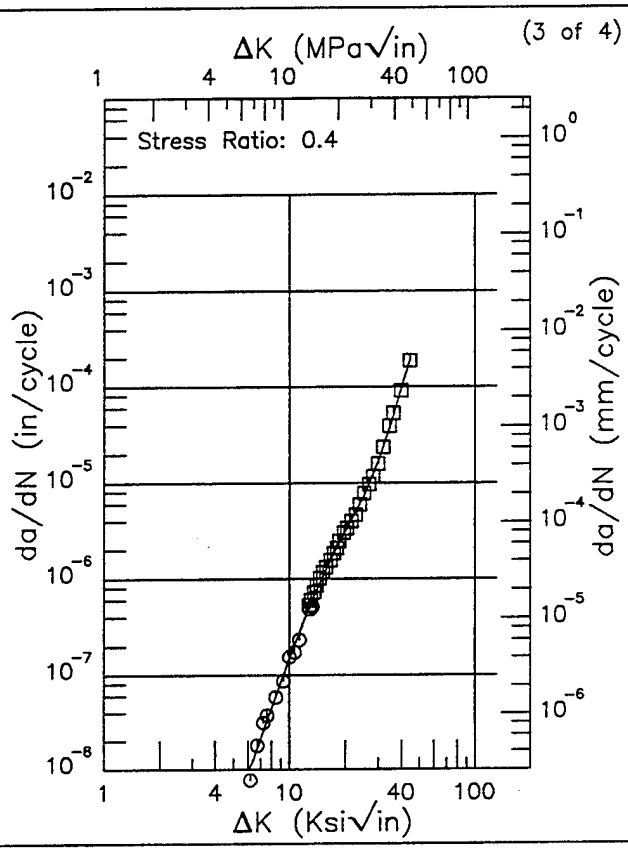
RMS % Error	Life Prediction Ratio Summary
81.12	0. .5 .8 1.25 2.

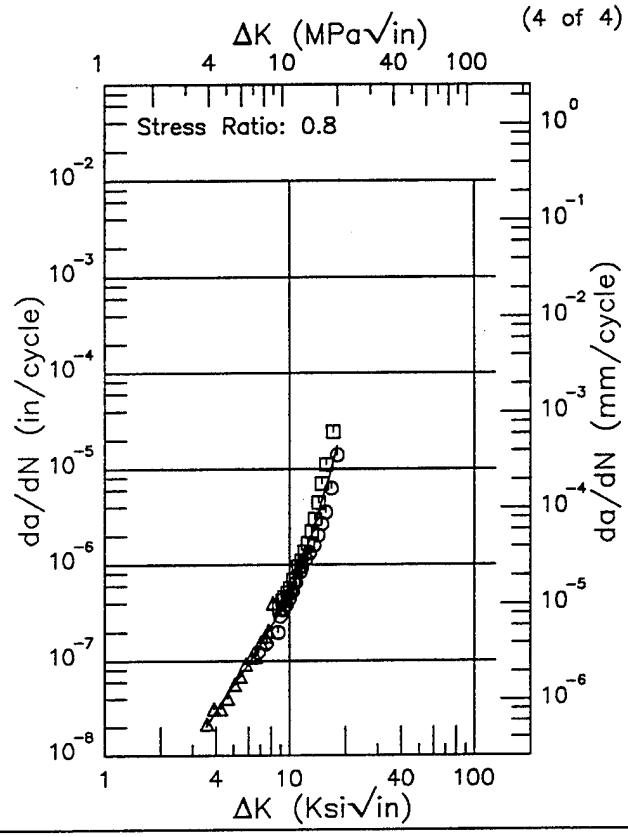
Figure 5.9.3.1.46

INCONEL 718 R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 5 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 155.4 – 169. ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.254 in.
Specimen Width: 2.001 – 2.007 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.15 (min)	0.0105
7.	0.0211
8.	0.0441
9.	0.0839
10.	0.148
13.	0.553
16.	1.37
20.	3.13
25.	7.28
30.	16.8
35.	40.9
40.	99.9
44.22 (max)	183.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.56 (min)	0.0201
4.	0.0293
5.	0.0560
6.	0.0930
7.	0.146
8.	0.224
9.	0.340
10.	0.518
13.	1.87
16.	7.01
18.01 (max)	17.3

RMS % Error	Life Prediction Ratio Summary
9.55	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
27.65	0. .5 .8 1.25 2.

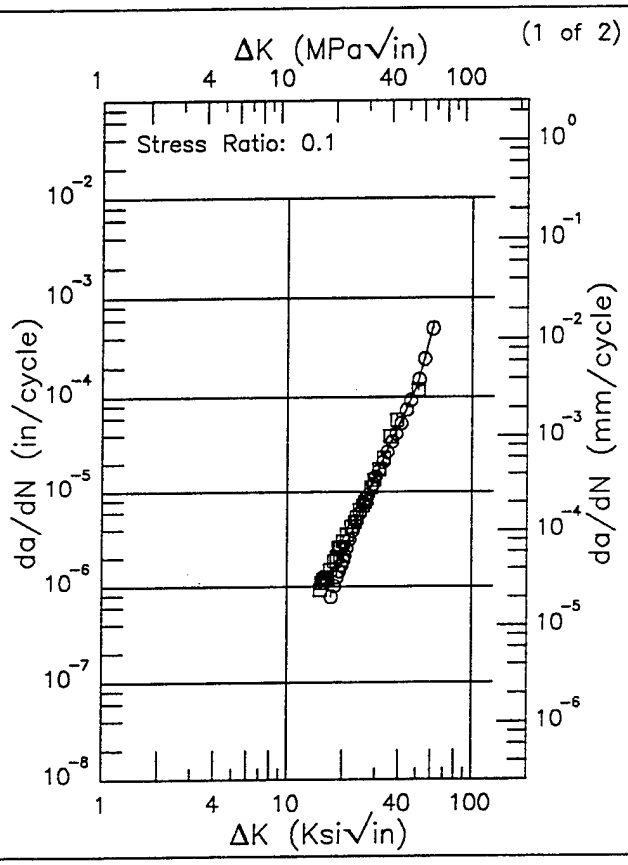
Figure 5.9.3.1.46 (Concluded)

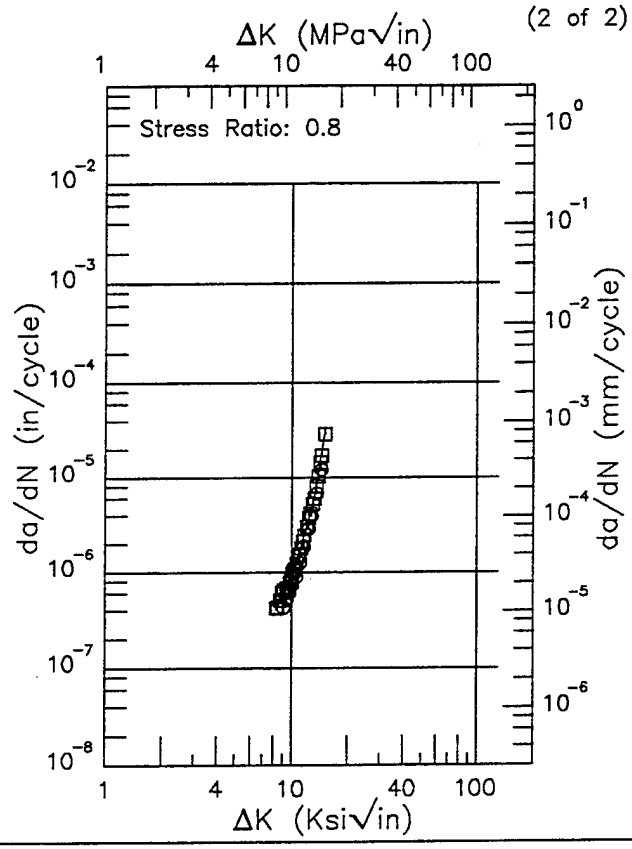
INCONEL 718

R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: DIST WATER; RT

Yield Strength: 155.4 – 169. ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.252 in.
Specimen Width: 2.003 – 2.005 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.08 (min)	0.951
16.	1.09
20.	2.30
25.	6.21
30.	14.8
35.	29.7
40.	50.4
50.	127.
60.	449.
60.84 (max)	510.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.25 (min)	0.403
9.	0.555
10.	0.826
13.	5.08
14.97 (max)	28.5

RMS % Error	Life Prediction Ratio Summary
14.98	0. .5 .8 1.25 2.

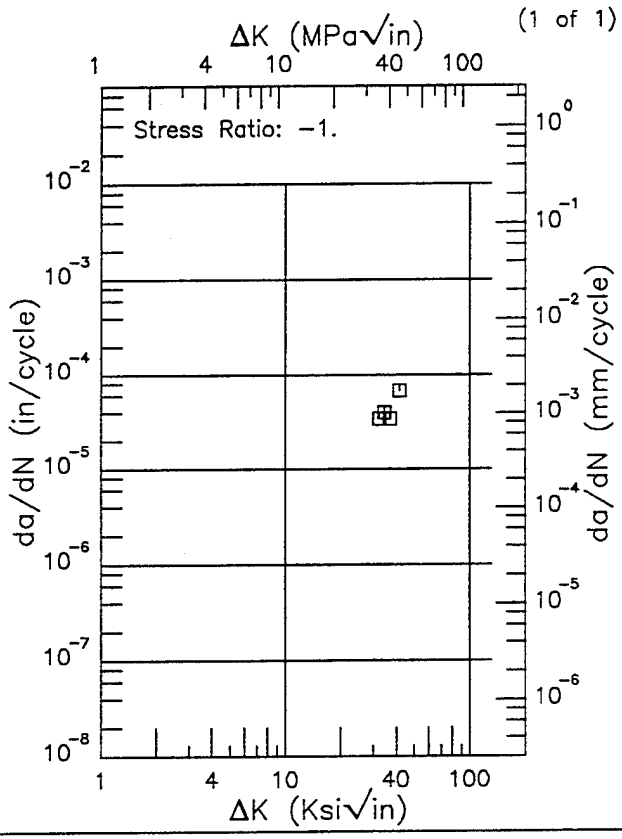
RMS % Error	Life Prediction Ratio Summary
12.36	0. .5 .8 1.25 2.

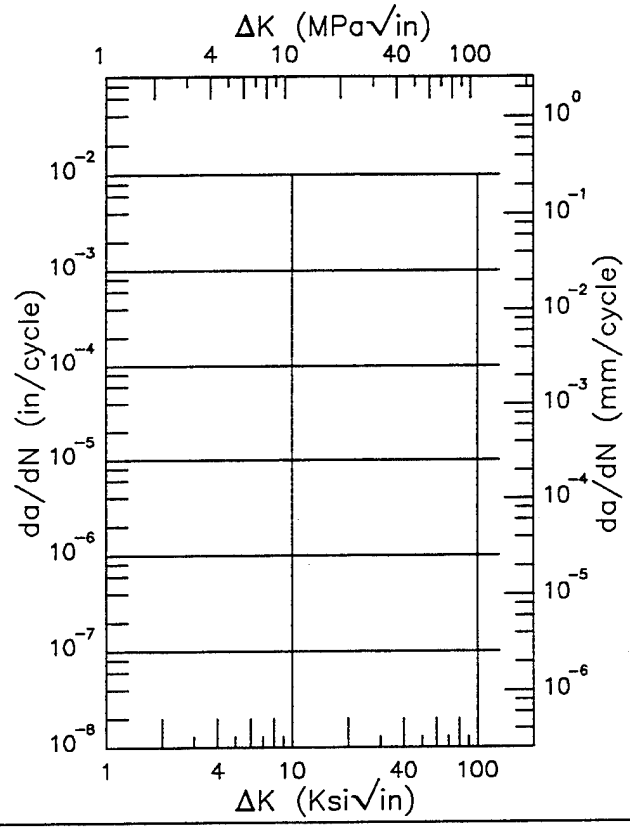
Figure 5.9.3.1.47

INCONEL 718 R

Condition/Ht: STA
Form: 3 in. Forging
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 5 Hz
Environment: LAB AIR; RT

Yield Strength: 177.2 ksi
Ult. Strength:
Specimen Thk: 0.204 in.
Specimen Width: 4.008 in.
Ref: DA006





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

Figure 5.9.3.1.48

TABLE 5.9.3.3

(1 of 2)

K_{Iscc} SUMMARY FOR NICKEL-BASED SUPER ALLOY INCONEL 718

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
1850F 1.5HR OQ; 1360F 9HRS FC TO 1175F OQ; 1360F 9HRS FC TO 1175F	FB	R.T.	L-T	160	S.C.S.	DCB	2	1	4	---	103	>166*	60180	1976	RI006
						DCB	2	1	4	---	103	>86	60180	1976	RI006
					S.T.W.	DCB	2	1	4	---	103	>86	60060	1976	RI006
						DCB	2	1	4	---	103	>180*	119100	1976	RI006
			T-L	160	S.T.W.	DCB	2	1	4	---	104	>89	60060	1976	RI006
						DCB	2	1	4	---	104	121*	119100	1976	RI006
			S-L	160	S.T.W.	DCB	2	1	4	---	104	>87	60120	1976	RI006
						DCB	2	1	4	---	104	>99	76380	1976	RI006

TABLE 5.9.3.3 (CONCLUDED)

(2 of 2)

K_{Iscc} SUMMARY FOR NICKEL-BASED SUPER ALLOY INCONEL 718

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
1880F 1HR AC; 1520F 8HR FC; 1200F 16HR AC; 1520F 8HR FC; 1200F 16HR AC	S	R.T.	---	---	Aerozine 50	WOL	1.3	0.125	0.13	---	---	80+	---	1974	88700
					Martin-Marietta refined grade hydrazine	WOL	1.3	0.125	0.13	---	---	79+	---	1974	88700
					Martin-Marietta refined grade hydrazine - 2% oxygen	WOL	1.3	0.125	0.13	---	---	79+	---	1974	88700
					Matheson-Coleman-Bell 97% grade hydrazine	WOL	1.3	0.125	0.13	---	---	25.8+	---	1974	88700
					Propellant grade hydrazine	WOL	1.3	0.125	0.13	---	---	87.5+	---	1974	88700

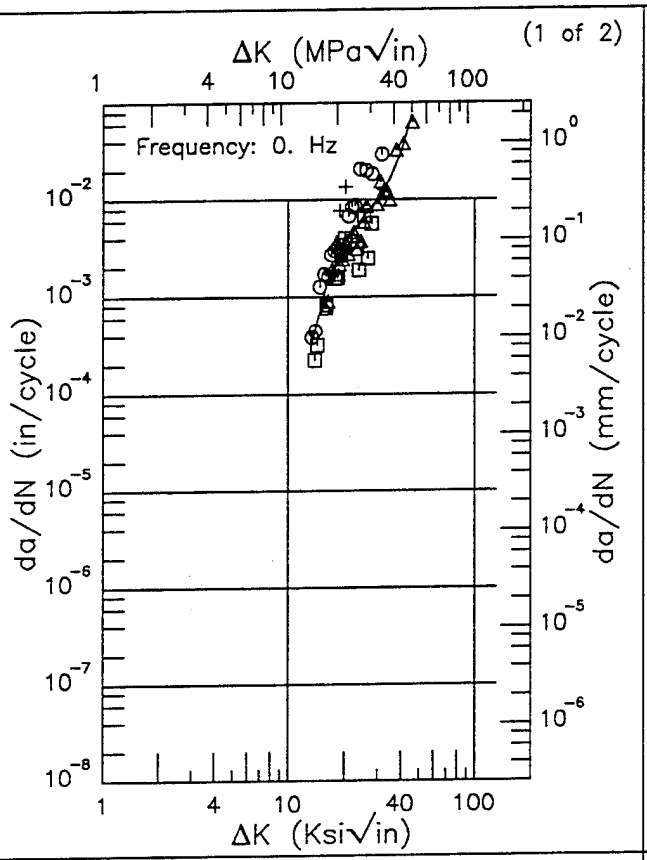
+ specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

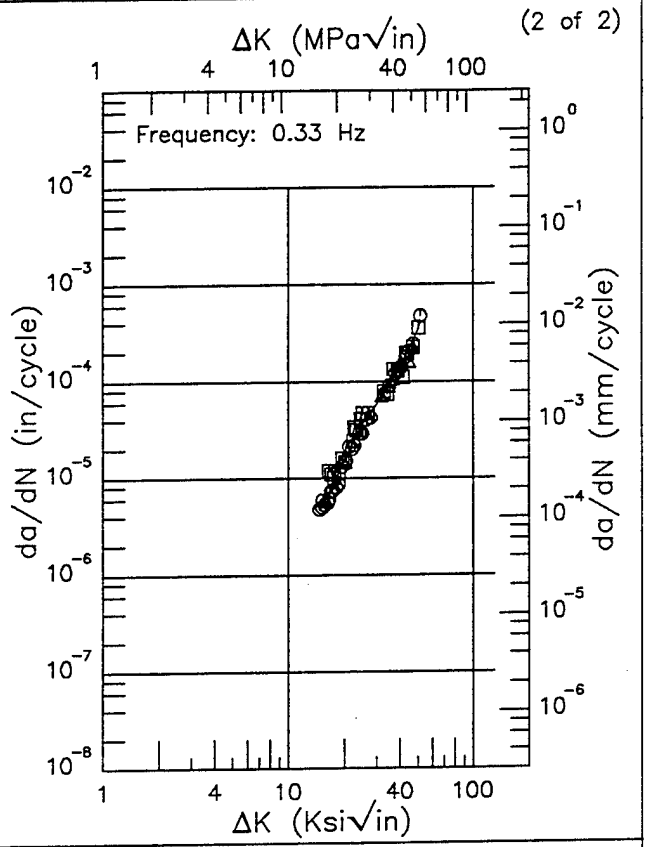
NASA IIB-7 P/M

F

Condition/Ht: 1650F 16HRS TO 2000F 1HR OQ
Form: 1.75 in. Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 208.6 ksi
Ult. Strength: 257.1 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.30 (min)	315.
16.	1303.
20.	3593.
25.	6526.
30.	10084.
35.	16495.
40.	30610.
45.79 (max)	74742.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.67 (min)	4.74
16.	6.09
20.	15.4
25.	36.7
30.	59.0
35.	91.8
40.	141.
50.	338.
51.24 (max)	432.

RMS % Error	Life Prediction Ratio Summary
73.31	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.78	0. .5 .8 1.25 2.

Figure 5.10.3.1

TABLE 5.11.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK P/M RENE 95 AT ROOM TEMPERATURE

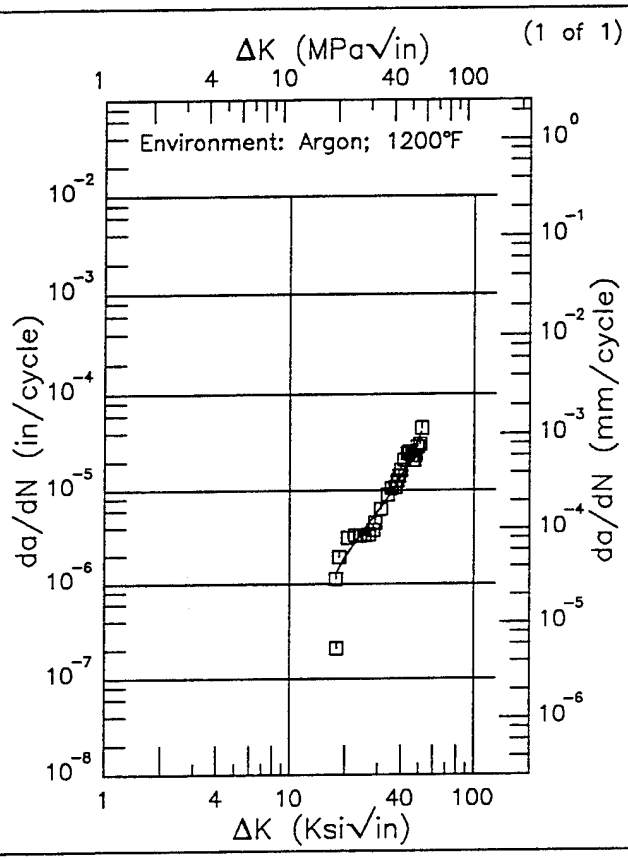
ORIENTATION: C-R **ENVIRONMENT: Lab Air**

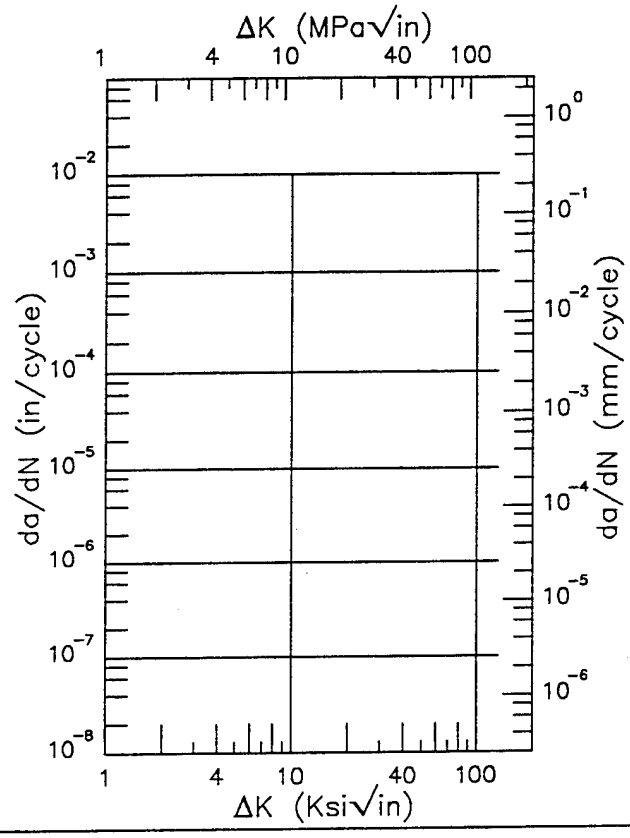
CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi/in)					
				2.5	5.0	10.0	20.0	50.0	100.0
2080F 1HR AC 1600F 1HR AC	DISK	0.	0.33				0.4	31.02	

E P/M RENE 95

Condition/Ht: 2080F 1HR AC 1600F 1HR AC
Form: 2.5 in. Disk
Specimen Type: CCP (max load specified)
Orientation: C–R
Stress Ratio: 0.
Frequency: 0.3 Hz

Yield Strength: 165.7 ksi
Ult. Strength: 228.6 ksi
Specimen Thk: 0.08 in.
Specimen Width: 2 in.
Ref: GE004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.82 (min)	1.29
20.	1.94
25.	3.71
30.	5.95
35.	9.11
40.	14.0
50.	35.3
51.58 (max)	41.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 24.97

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

Figure 5.11.3.1.1

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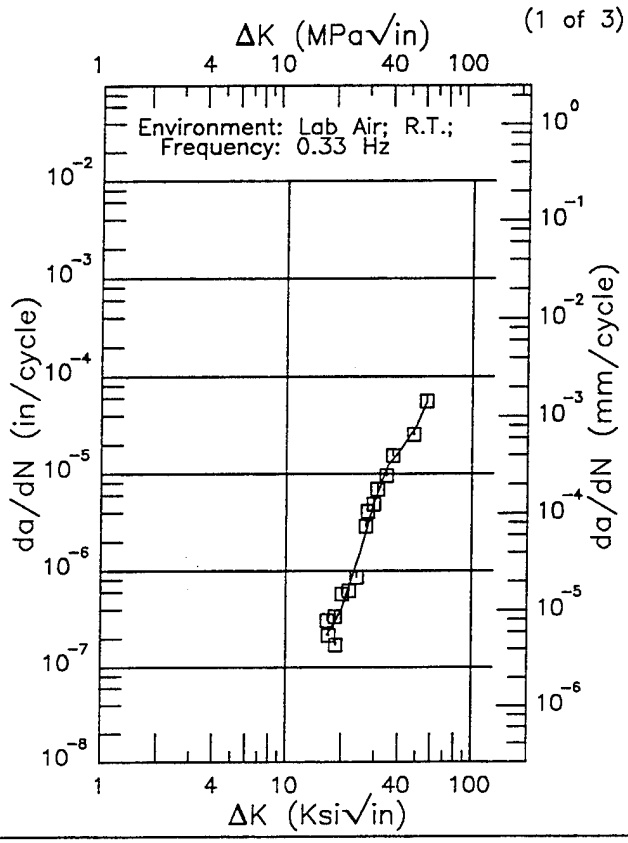
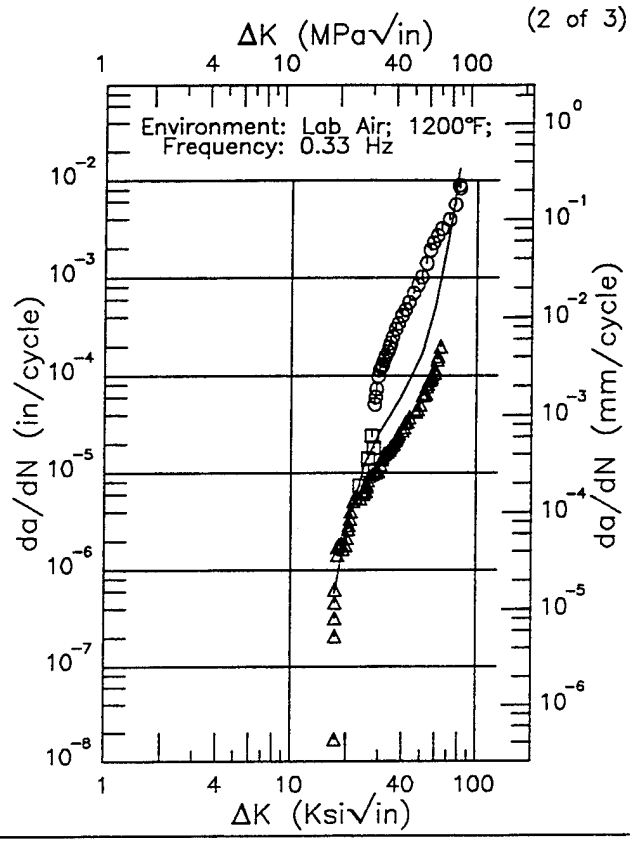
EF

P/M RENE 95

Condition/Ht: 2080F 1HR AC 1600F 1HR AC
Form: 2.5 in. Disk
Specimen Type: CCP (max stress specified)
Orientation: C–R
Stress Ratio: 0.

Yield Strength: 165.7 ksi
Ult. Strength: 228.6 ksi
Specimen Thk: 0.08 in.
Specimen Width: 2 in.
Ref: GE008





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.68 (min)	0.220
20.	0.400
25.	1.56
30.	5.41
35.	12.2
40.	16.5
50.	31.0
56.41 (max)	55.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.22 (min)	0.577
20.	2.67
25.	12.0
30.	25.7
35.	42.0
40.	63.7
50.	159.
60.	517.
70.	2253.
80.	12711.
80.21 (max)	13214.

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
24.27	0. .5 .8 1.25 2.	>100.0	0. .5 .8 1.25 2.

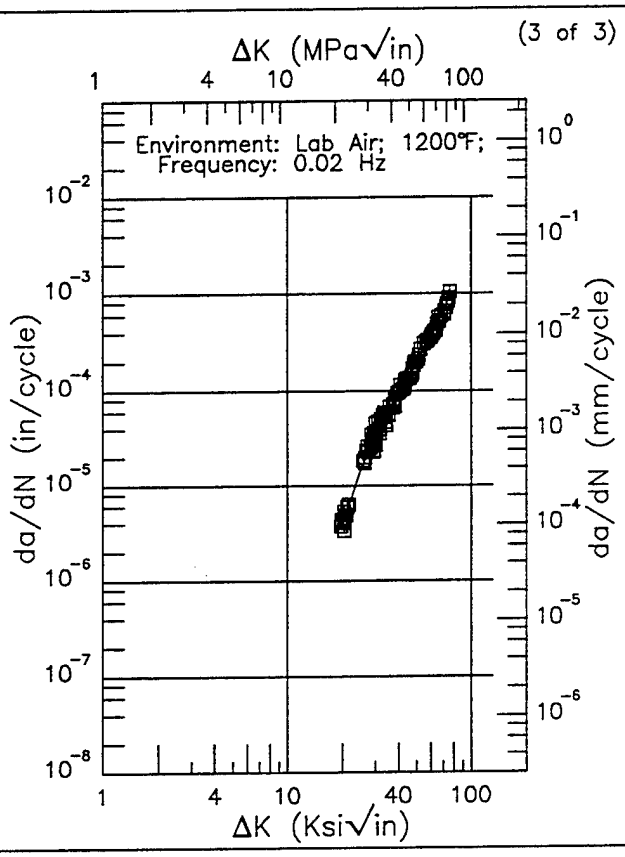
Figure 5.11.3.1.2

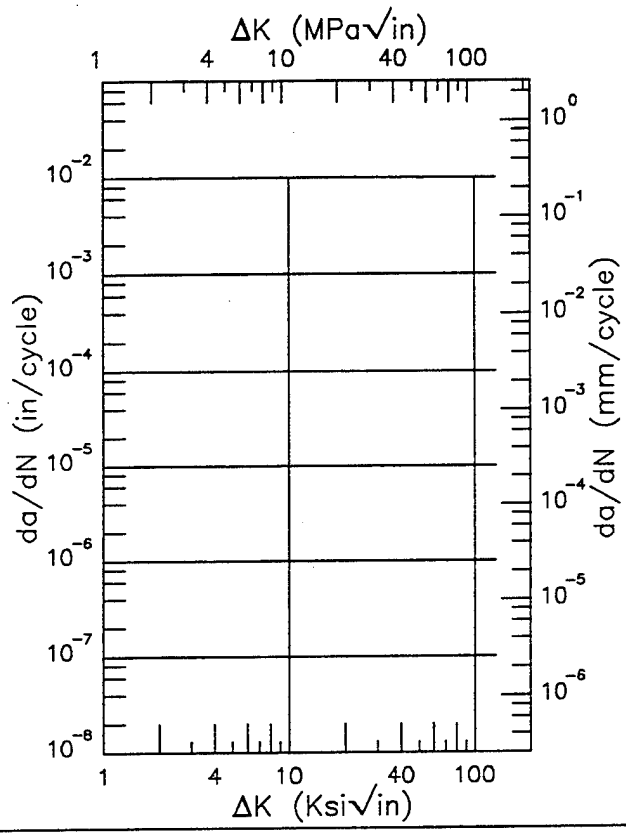
P/M RENE 95 EF

Condition/Ht: 2080F 1HR AC 1600F 1HR AC
Form: 2.5 in. Disk
Specimen Type: CCP (max stress specified)
Orientation: C–R
Stress Ratio: 0.

Yield Strength: 165.7 ksi
Ult. Strength: 228.6 ksi
Specimen Thk: 0.08 in.
Specimen Width: 2 in.
Ref: GE008

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.55 (min)	3.45
20.	4.03
25.	14.8
30.	33.9
35.	61.3
40.	97.0
50.	200.
60.	369.
70.	662.
76.15 (max)	948.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 11.29

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 5.11.3.1.2 (Concluded)

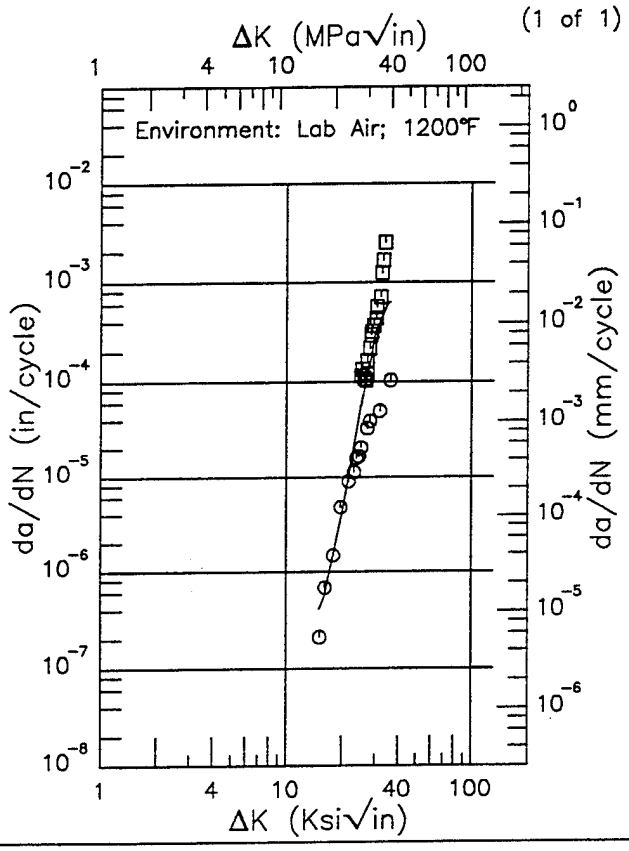
P/M RENE 95

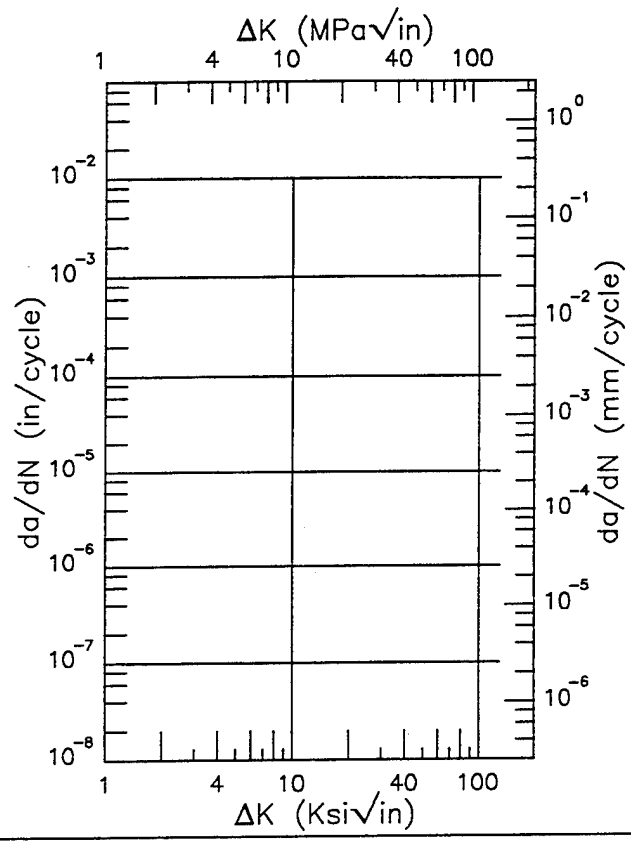
E

Condition/Ht: 2080F 1HR AC 1600F 1HR AC
Form: 2.5 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.
Frequency: 0.3 Hz

Yield Strength: 165.7 ksi
Ult. Strength: 228.6 ksi
Specimen Thk: 0.25 in.
Specimen Width: 0.6 in.
Ref: GE008

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.06 (min)	0.413
16.	0.553
20.	4.05
25.	53.0
30.	301.
35.	615.
36.31 (max)	630.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

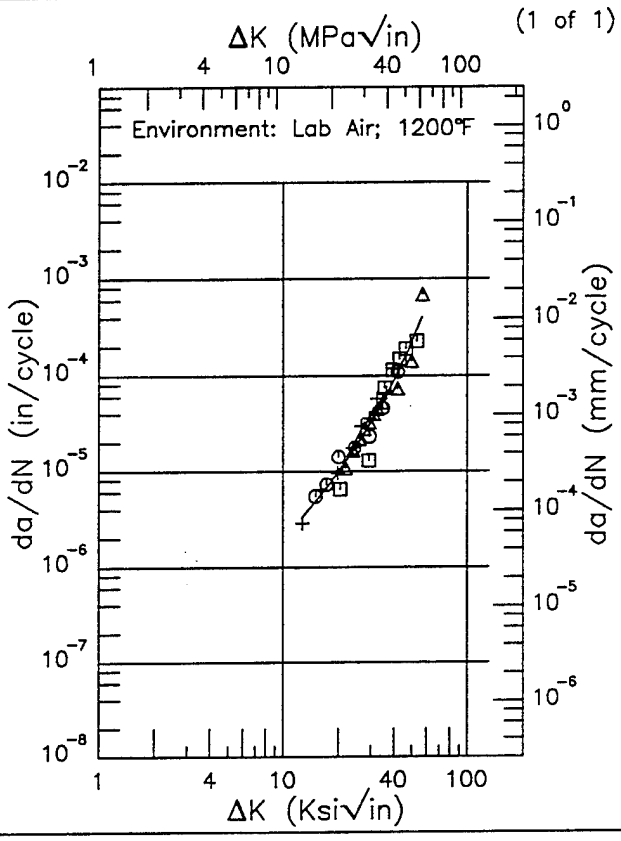
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

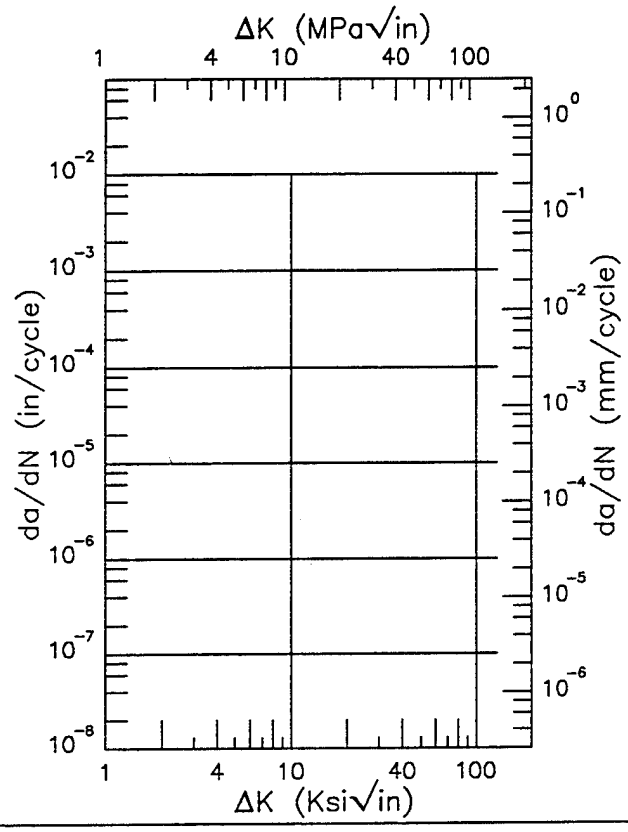
Figure 5.11.3.1.3

P/M RENE 95 E

Condition/Ht: 2100F 1HR SQ AT 1000F
Form: 1 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.3 Hz

Yield Strength: 176.1 ksi
Ult. Strength:
Specimen Thk: 0.25 in.
Specimen Width: 0.6 in.
Ref: GE001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.70 (min)	3.28
13.	3.46
16.	5.69
20.	10.0
25.	18.6
30.	32.7
35.	55.1
40.	90.4
50.	228.
56.60 (max)	405.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 25.51

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 5.11.3.1.4

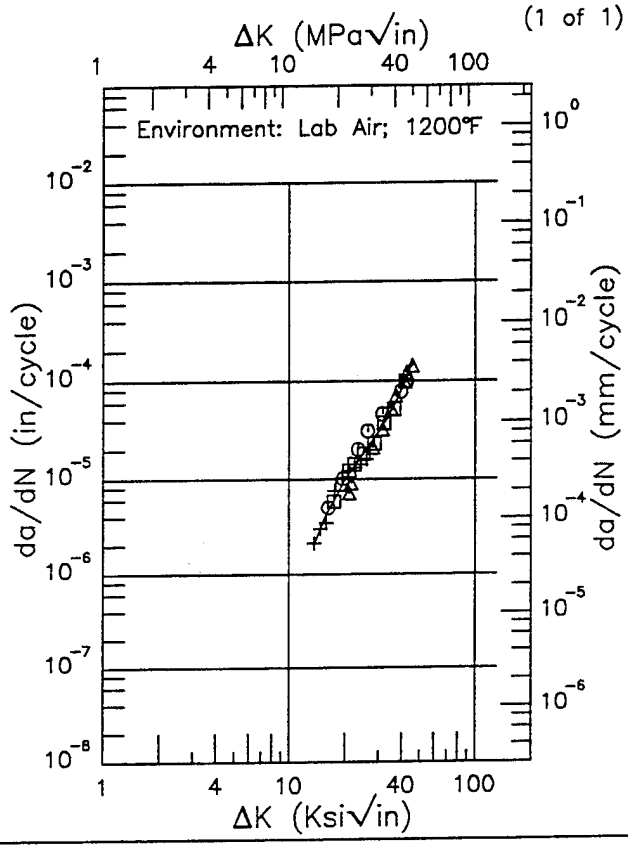
RENE 95 (H&F)

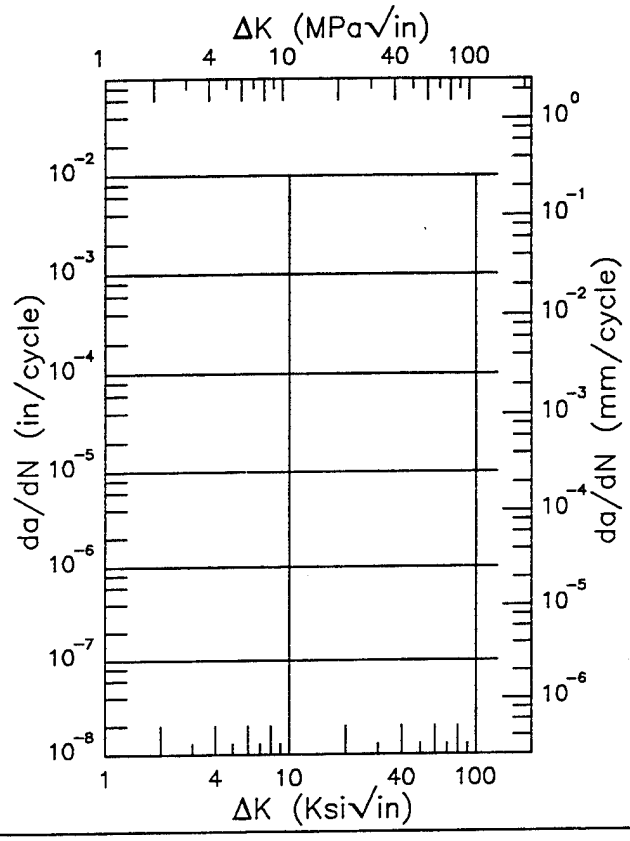
E

Condition/Ht: 2000F 1HR SQ AT 1000F
Form: 1.23 in. Forging
Specimen Type: KB Bar
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.3 Hz

Yield Strength: 171 ksi
Ult. Strength:
Specimen Thk: 0.25 in.
Specimen Width: 0.6 in.
Ref: GE001

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.58 (min)	2.02
16.	4.44
20.	9.83
25.	18.3
30.	30.2
35.	49.1
40.	82.0
45.70 (max)	155.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error
16.78

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

Figure 5.12.3.1

TABLE 5.13.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK WASPALOY AT ROOM TEMPERATURE

ORIENTATION: Unspecified **ENVIRONMENT: Lab Air**

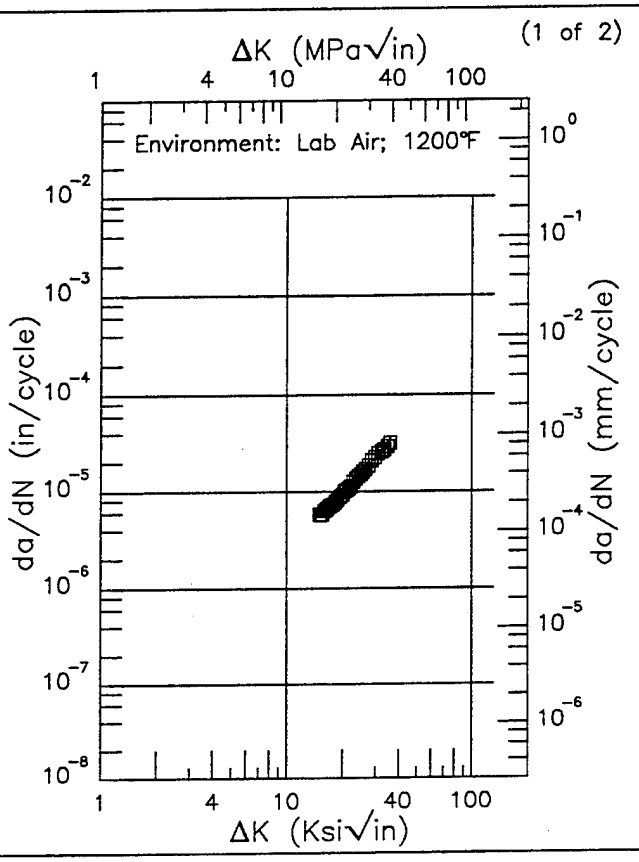
CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1850F 2HRS 1350F 6HRS	BILLET	0.1	10					10.46	
2010F 2HRS 1350F 6HRS	BILLET	0.1	10					2.8	
2010F 2HRS 1600F 24HRS	BILLET	0.1	10					9.56	

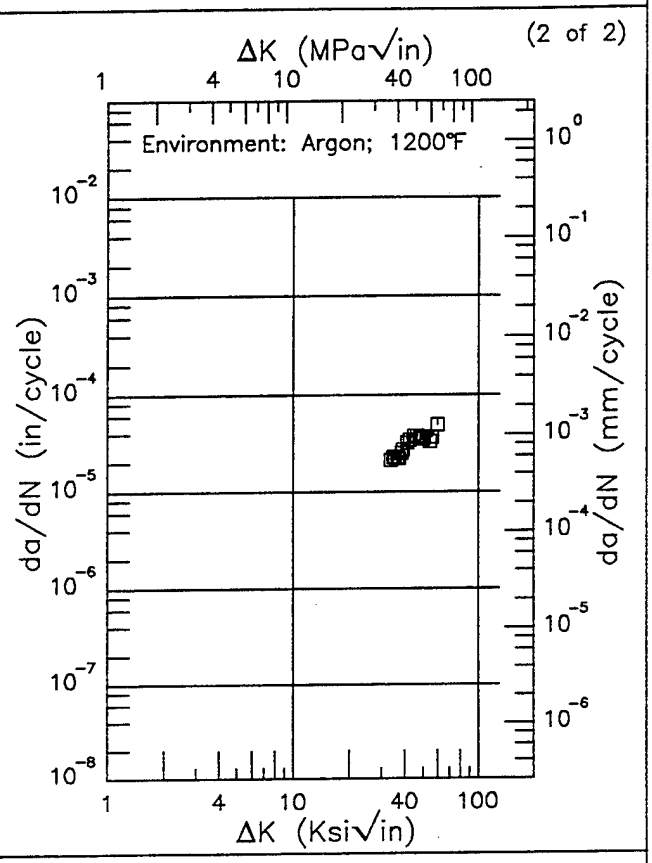
WASPALOY

E

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.3 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.25 – 0.452 in.
Specimen Width:
Ref: PW006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.91 (min)	5.71
16.	6.28
20.	9.44
25.	15.3
30.	22.6
35.	29.8
35.87 (max)	31.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
33.32 (min)	18.2
35.	21.9
40.	29.8
50.	35.3
59.56 (max)	42.8

RMS % Error	Life Prediction Ratio Summary
1.73	0. .5 .8 1.25 2.

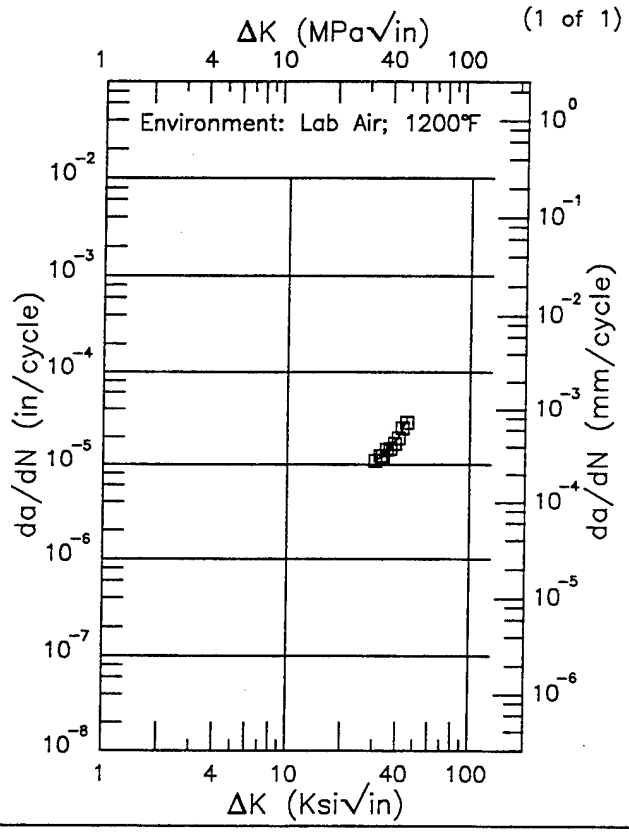
RMS % Error	Life Prediction Ratio Summary
9.57	0. .5 .8 1.25 2.

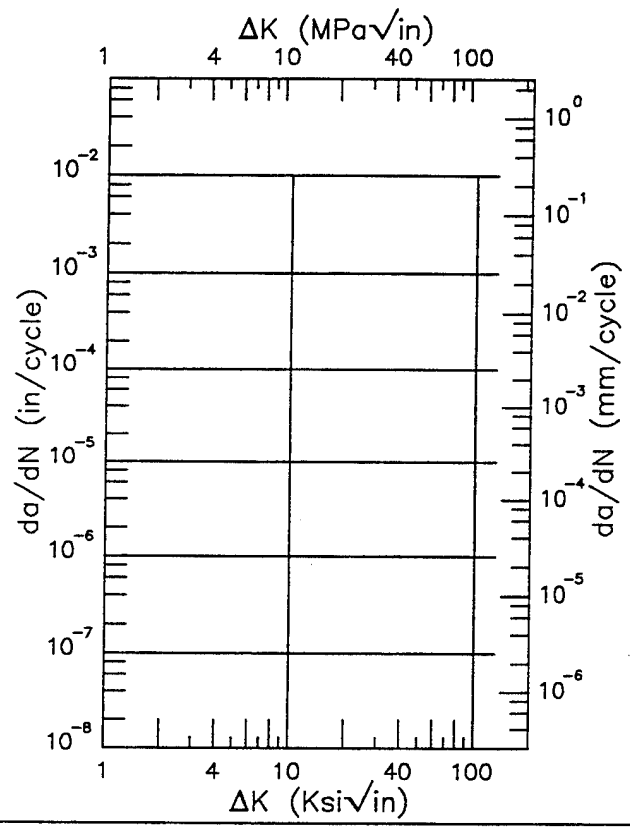
Figure 5.13.3.1.1

WASPALOY E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation:
Stress Ratio: 0.05
Frequency: 20 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.753 in.
Specimen Width: 2.505 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
30.41 (min)	11.0
35.	13.7
40.	18.8
44.85 (max)	29.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
3.19	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

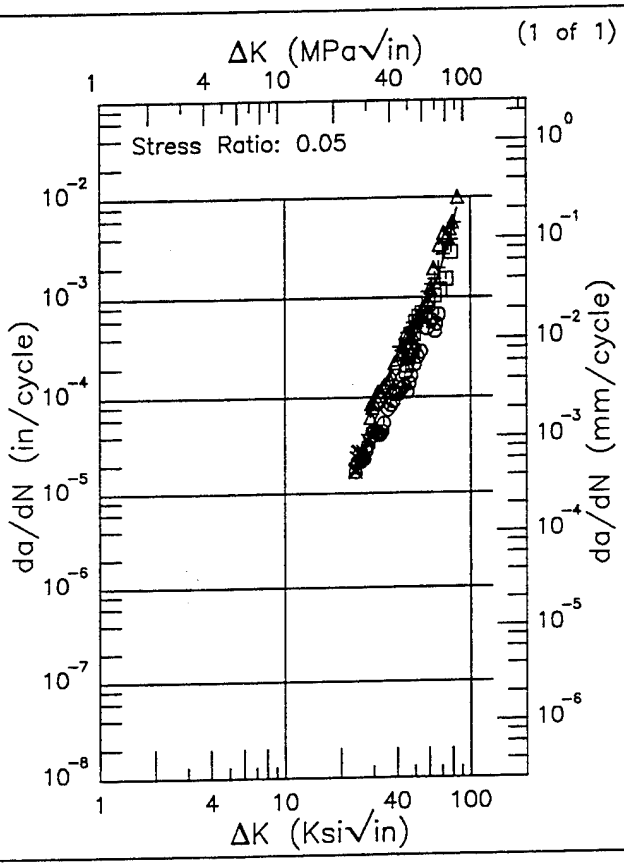
Figure 5.13.3.1.2

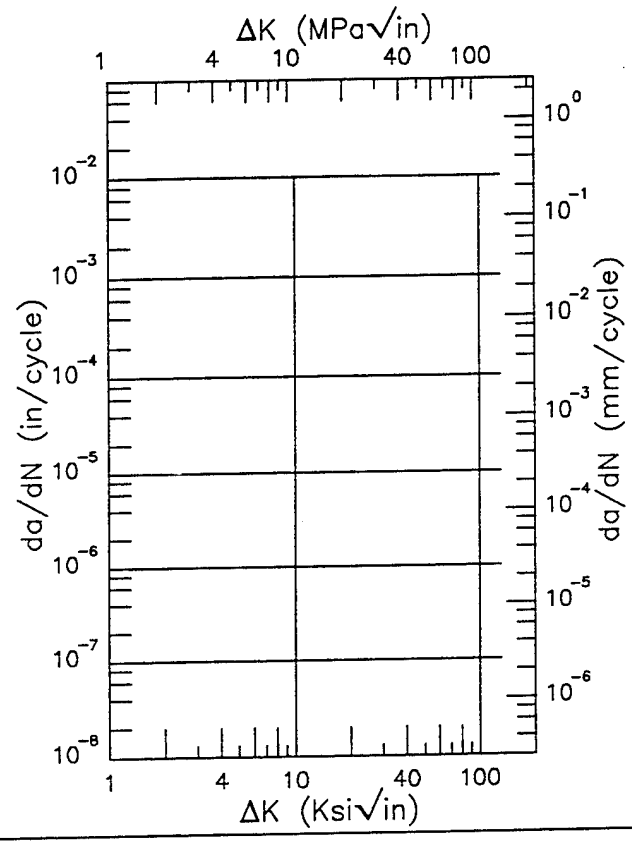
R

WASPALOY

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Frequency:
Environment: LAB AIR;1200°F

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.316 – 0.422 in.
Specimen Width: 2.504 – 2.509 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.65 (min)	16.2
25.	22.3
30.	54.9
35.	103.
40.	170.
50.	394.
60.	885.
70.	2061.
80.	5074.
84.43 (max)	7701.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 38.52

Life Prediction Ratio Summary

⊙ ⊡ × ⊿

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

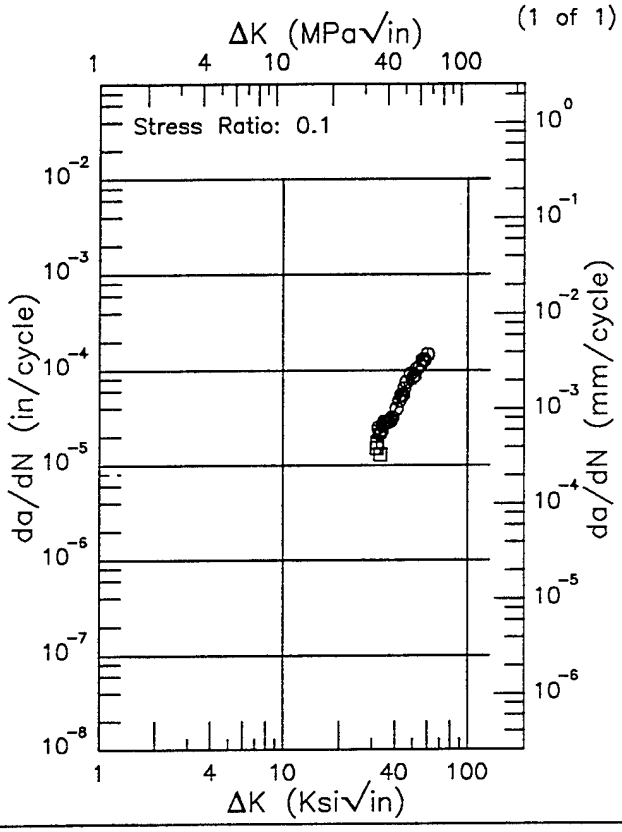
0. .5 .8 1.25 2.

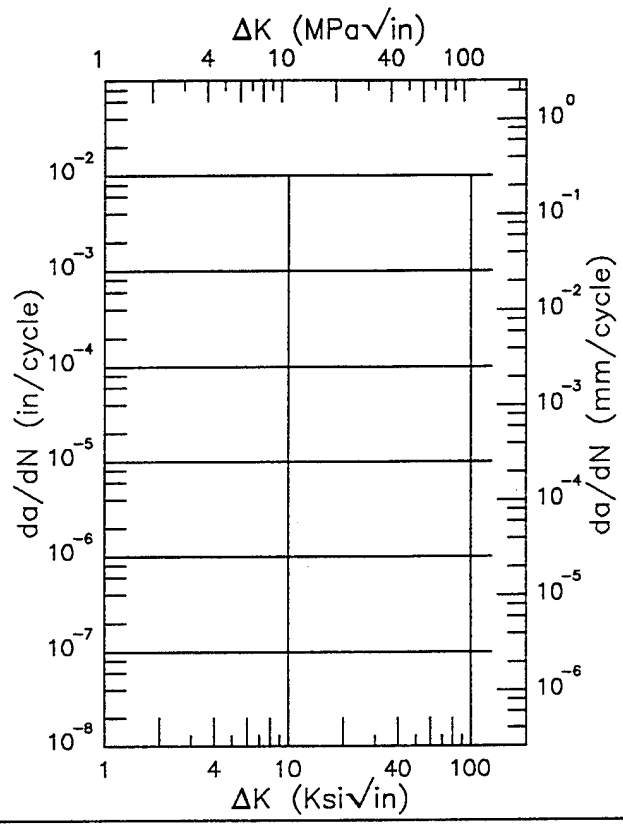
Figure 5.13.3.1.3

WASPALOY R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Frequency:
Environment: LAB AIR;1350°F

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.299 – 0.3 in.
Specimen Width: 2.504 – 2.511 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
31.69 (min)	17.6
35.	25.5
40.	37.6
50.	93.8
60.	150.
60.02 (max)	150.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.82	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

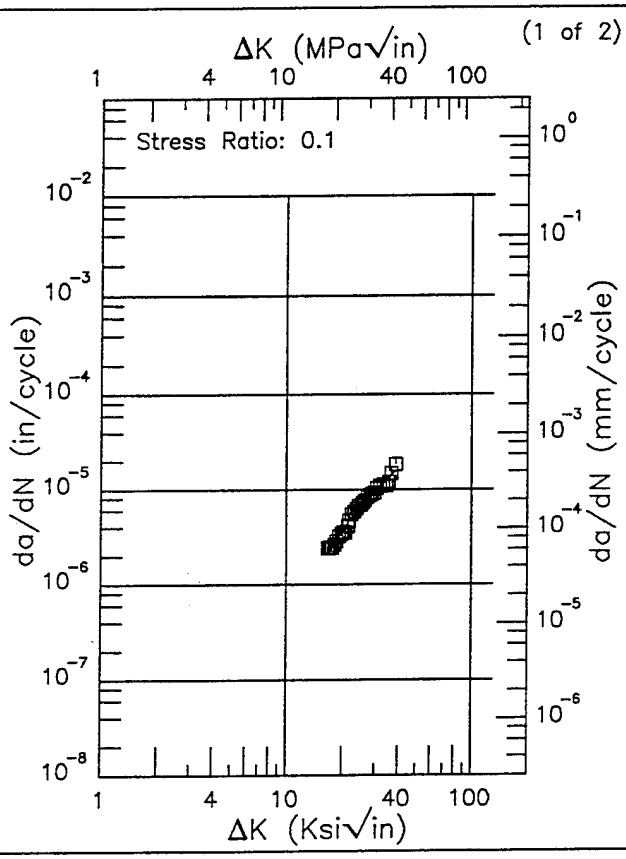
Figure 5.13.3.1.4

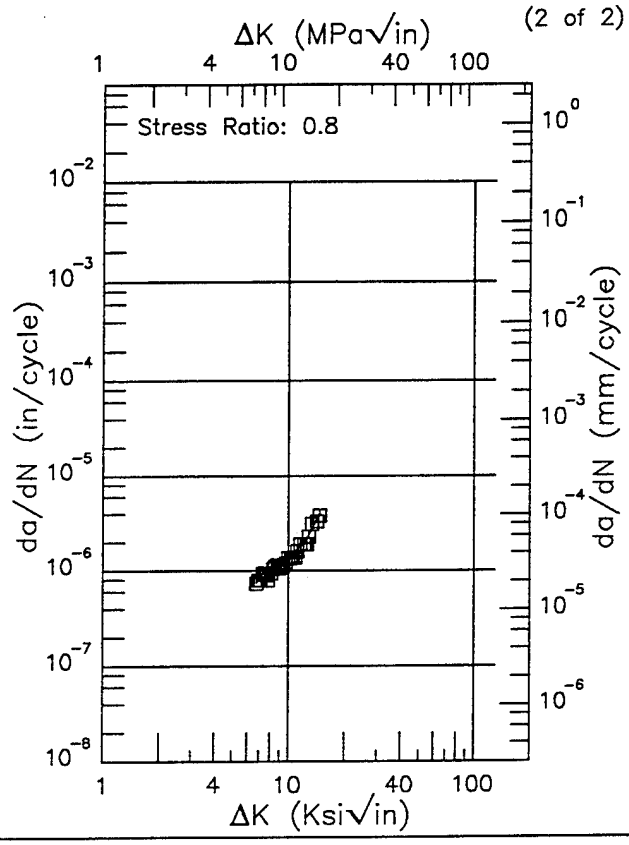
WASPALOY

R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR;1200°F

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.3 – 0.302 in.
Specimen Width: 2.503 – 2.518 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.66 (min)	2.04
20.	3.73
25.	6.59
30.	9.62
35.	13.0
38.72 (max)	15.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.75 (min)	0.761
7.	0.801
8.	0.947
9.	1.10
10.	1.28
13.	2.43
14.64 (max)	3.92

RMS % Error	Life Prediction Ratio Summary
7.34	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
7.28	0. .5 .8 1.25 2.

Figure 5.13.3.1.5

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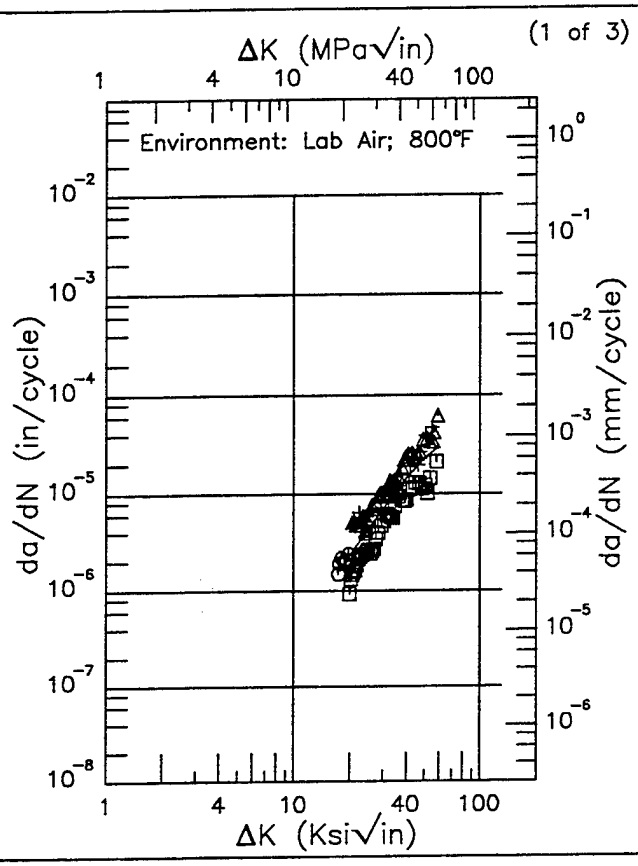
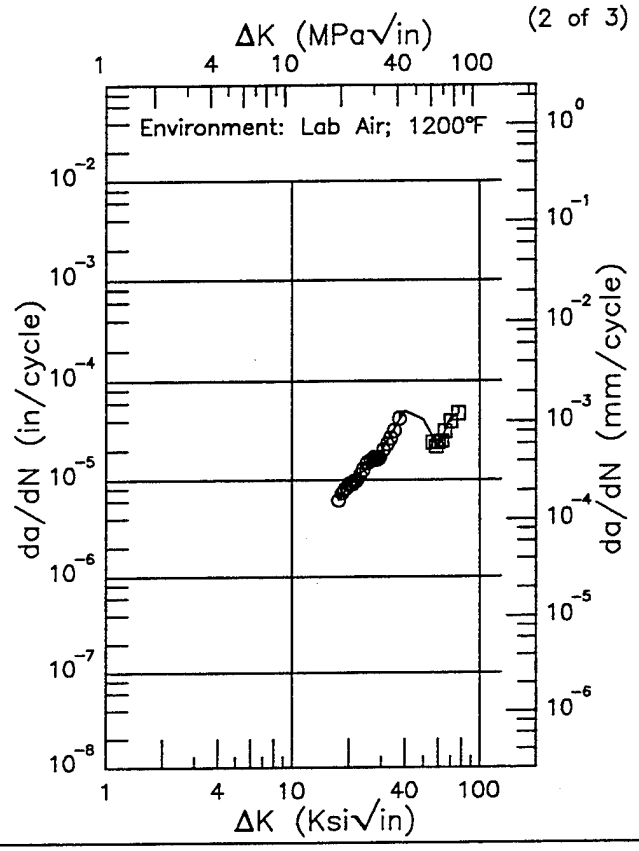
WASPALOY

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.102 – 0.501 in.
Specimen Width: 2.486 – 2.519 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.25 (min)	1.57
20.	2.32
25.	4.28
30.	7.01
35.	10.4
40.	14.4
50.	22.8
58.47 (max)	29.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.60 (min)	6.24
20.	8.79
25.	13.3
30.	19.6
35.	32.5
40.	50.4
50.	41.3
60.	21.8
70.	42.1
76.85 (max)	45.9

RMS % Error	Life Prediction Ratio Summary
44.49	□ ⊙ + △ 0. .5 .8 1.25 2.

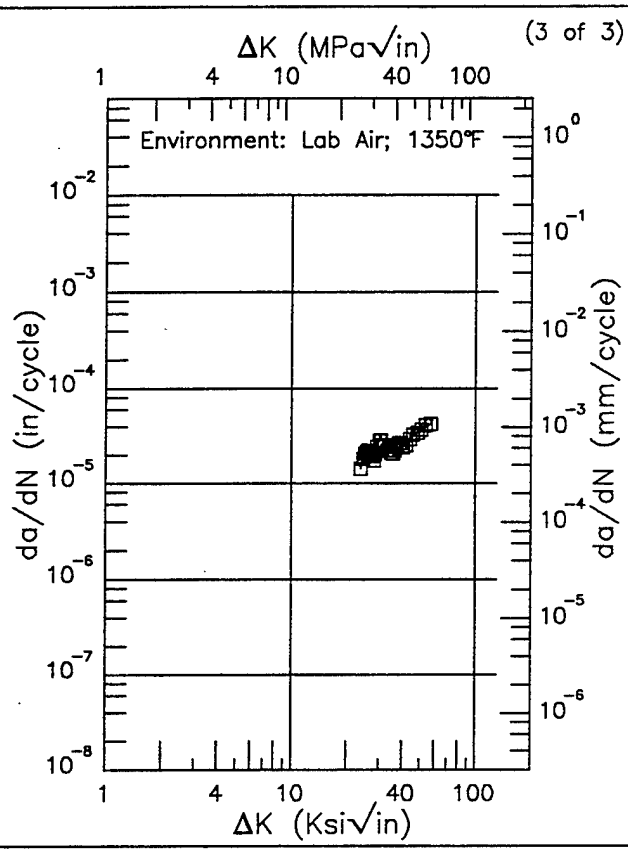
RMS % Error	Life Prediction Ratio Summary
5.85	□ ⊙ 0. .5 .8 1.25 2.

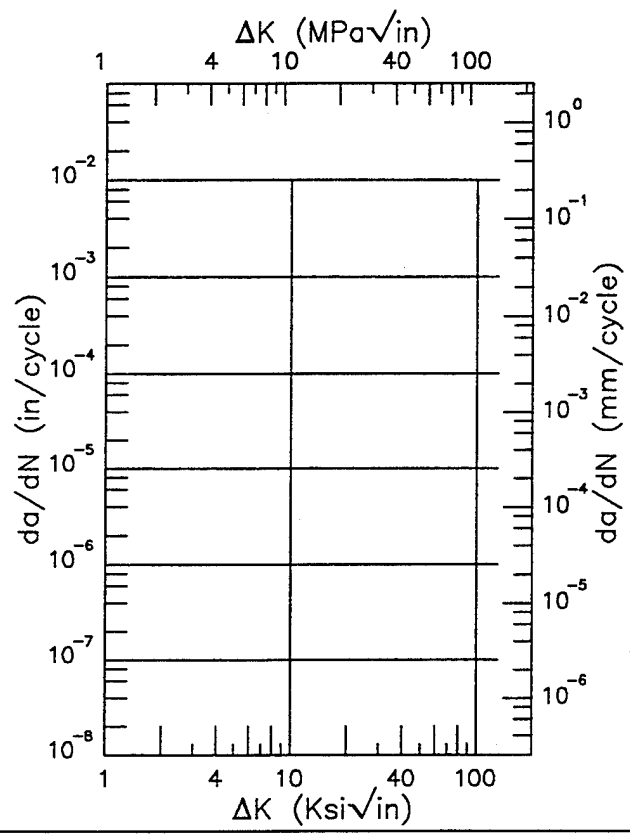
Figure 5.13.3.1.6

WASPALOY E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.102 – 0.501 in.
Specimen Width: 2.486 – 2.519 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.76 (min)	15.2
25.	18.6
30.	23.4
35.	22.8
40.	25.0
50.	36.3
56.57 (max)	42.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
9.06	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

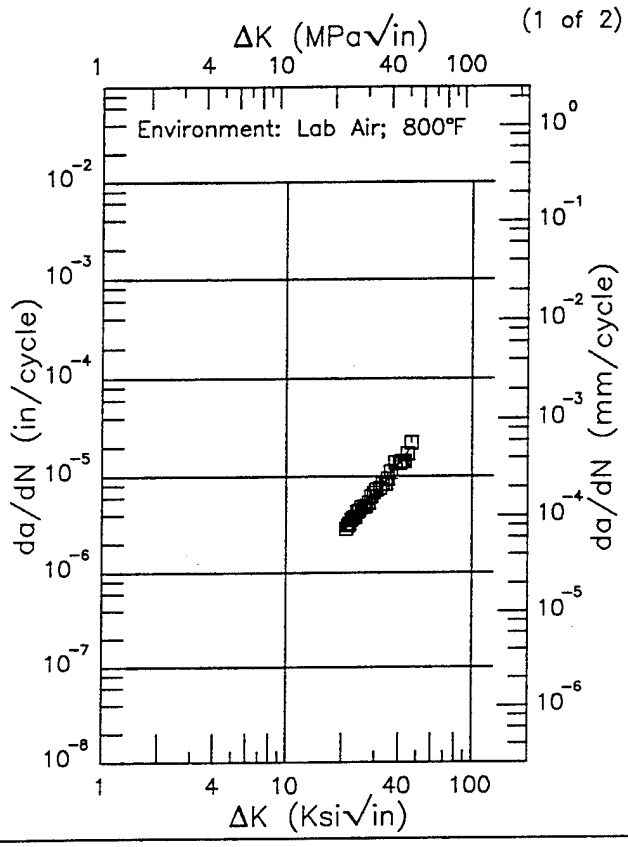
Figure 5.13.3.1.6 (Concluded)

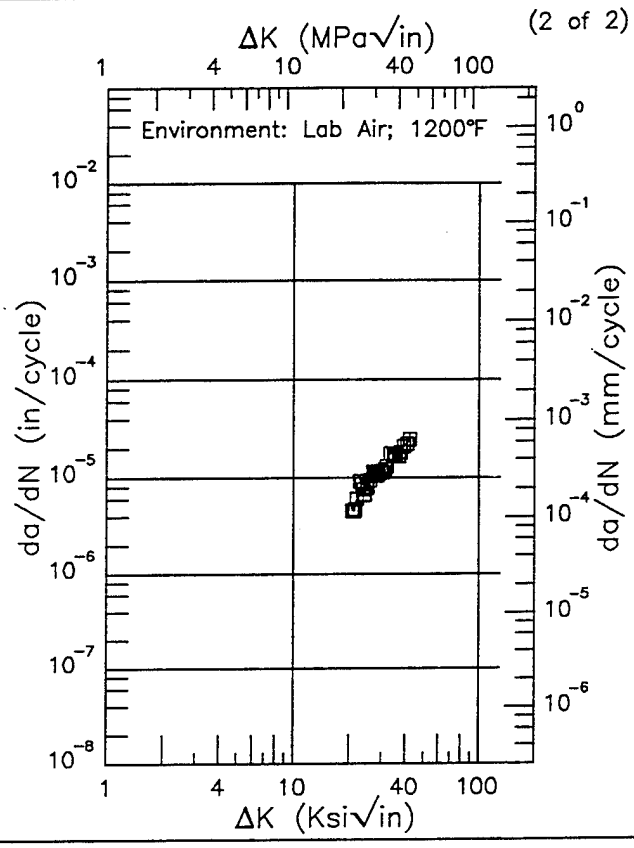
WASPALOY

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Frequency: 20 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.307 – 0.5 in.
Specimen Width: 2.508 – 2.51 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.94 (min)	2.96
25.	4.45
30.	6.72
35.	9.60
40.	13.3
46.62 (max)	19.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.71 (min)	4.85
25.	8.72
30.	12.5
35.	16.2
40.	21.5
42.08 (max)	24.6

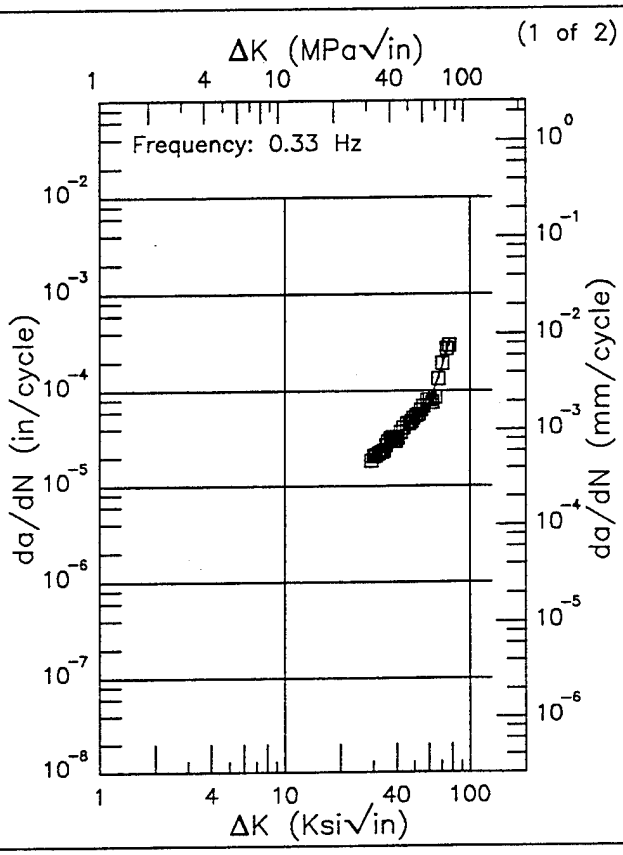
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
5.34	0. .5 .8 1.25 2.	11.97	0. .5 .8 1.25 2.

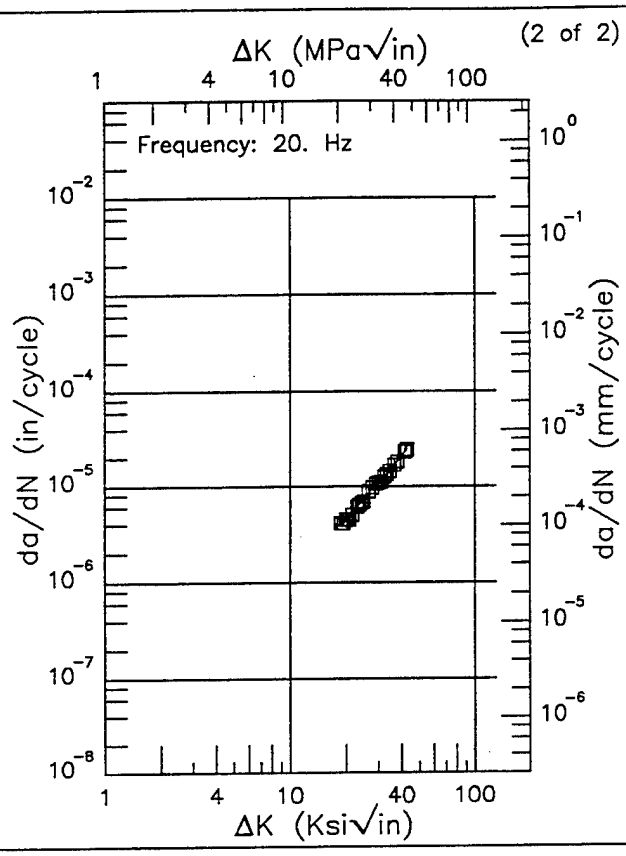
Figure 5.13.3.1.7

WASPALOY F

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.432 – 0.447 in.
Specimen Width: 2.502 – 2.503 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
29.22 (min)	18.3
30.	19.6
35.	26.2
40.	32.8
50.	54.9
60.	74.3
70.	176.
76.26 (max)	309.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.78 (min)	4.06
20.	4.32
25.	7.45
30.	11.0
35.	14.8
40.	21.1
42.53 (max)	23.9

RMS % Error	Life Prediction Ratio Summary
7.02	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
2.80	0. .5 .8 1.25 2.

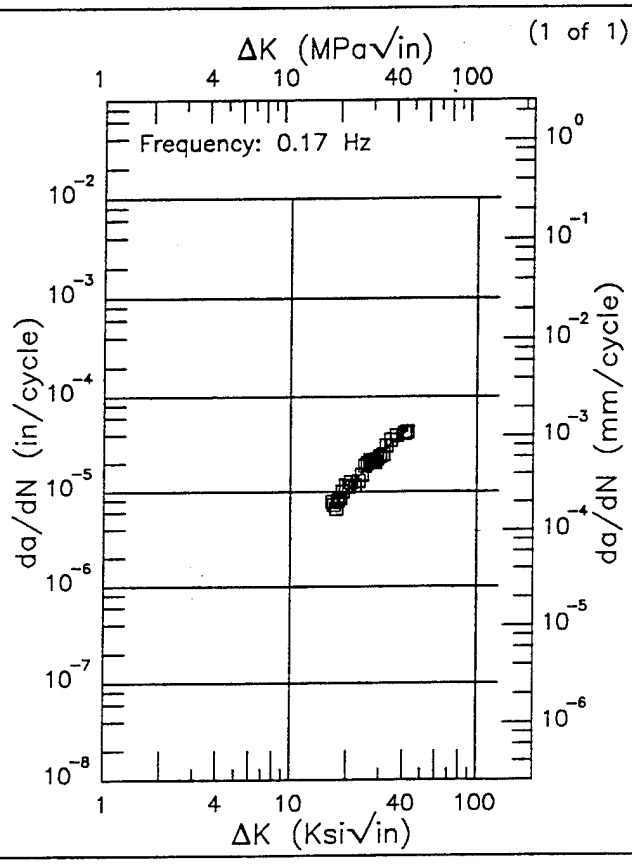
Figure 5.13.3.1.8

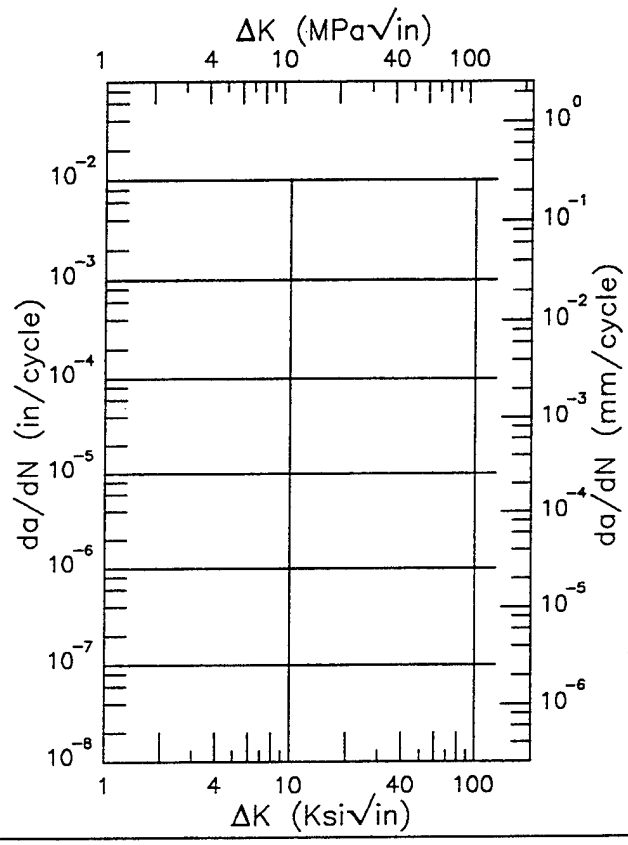
WASPALOY

F

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CT
Orientation: C–R
Stress Ratio: 0.1
Environment: LAB AIR;1200°F

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.318 in.
Specimen Width: 2.484 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.71 (min)	7.03
20.	10.4
25.	17.1
30.	25.1
35.	33.6
40.	41.5
42.17 (max)	44.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
8.10	0. .5 .8 1.25 2.

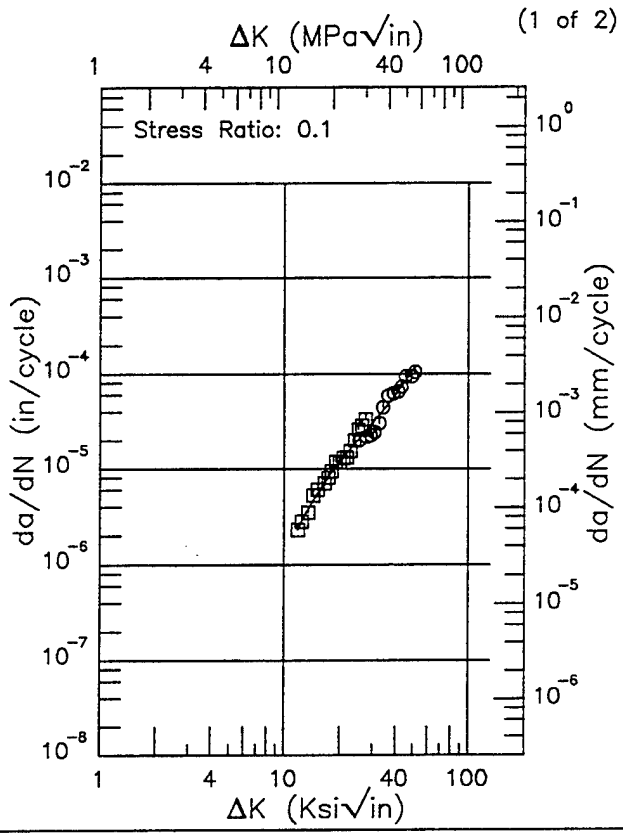
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

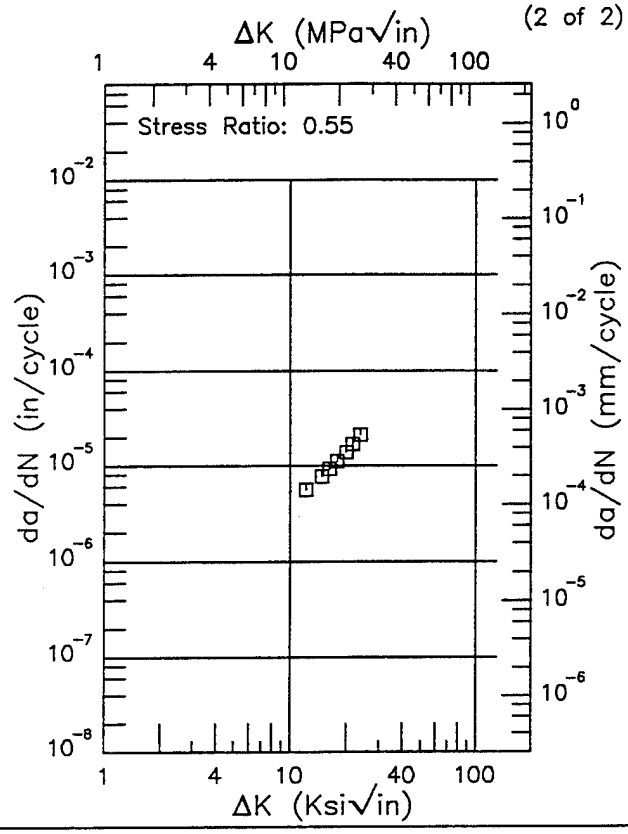
Figure 5.13.3.1.9

WASPALOY R

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Frequency: 0.2 Hz
Environment: LAB AIR;1200°F

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.287 – 0.297 in.
Specimen Width: 0.973 – 0.998 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.83 (min)	2.34
13.	3.35
16.	6.64
20.	12.1
25.	20.4
30.	30.6
35.	43.4
40.	60.0
50.	111.
51.07 (max)	119.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
13.74	0. .5 .8 1.25 2.

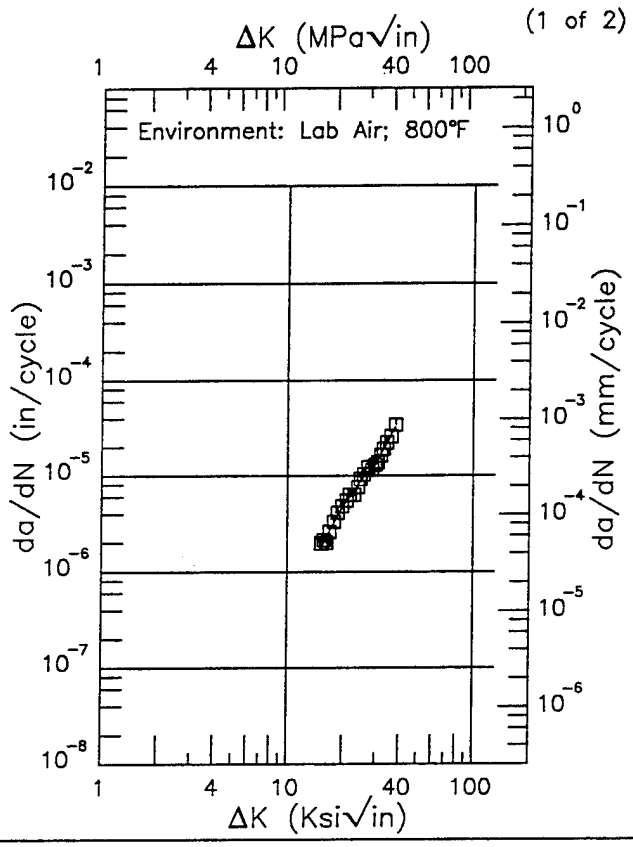
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

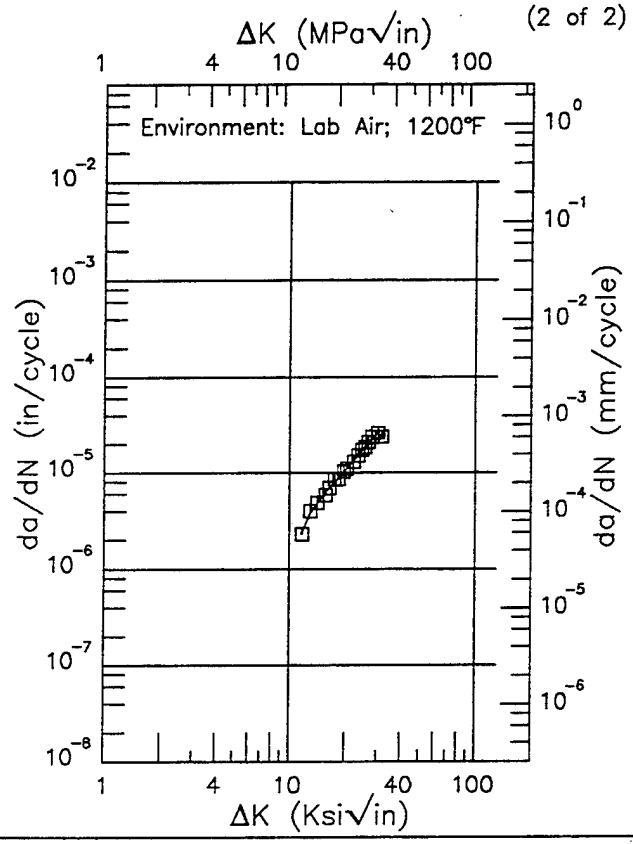
Figure 5.13.3.1.10

E WASPALOY

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: −1
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.297 − 0.3 in.
Specimen Width: 0.997 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.16 (min)	1.74
16.	2.18
20.	4.80
25.	9.05
30.	13.7
35.	23.6
37.90 (max)	32.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.63 (min)	2.32
13.	3.84
16.	6.44
20.	10.5
25.	17.3
30.	25.8
31.47 (max)	23.4

RMS % Error	Life Prediction Ratio Summary
6.56	0. .5 .8 1.25 2.

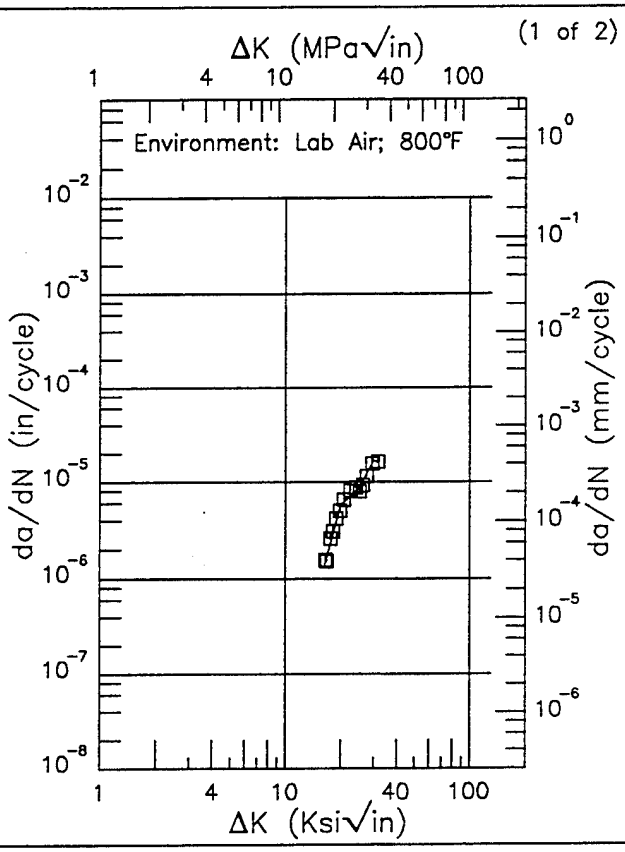
RMS % Error	Life Prediction Ratio Summary
3.61	0. .5 .8 1.25 2.

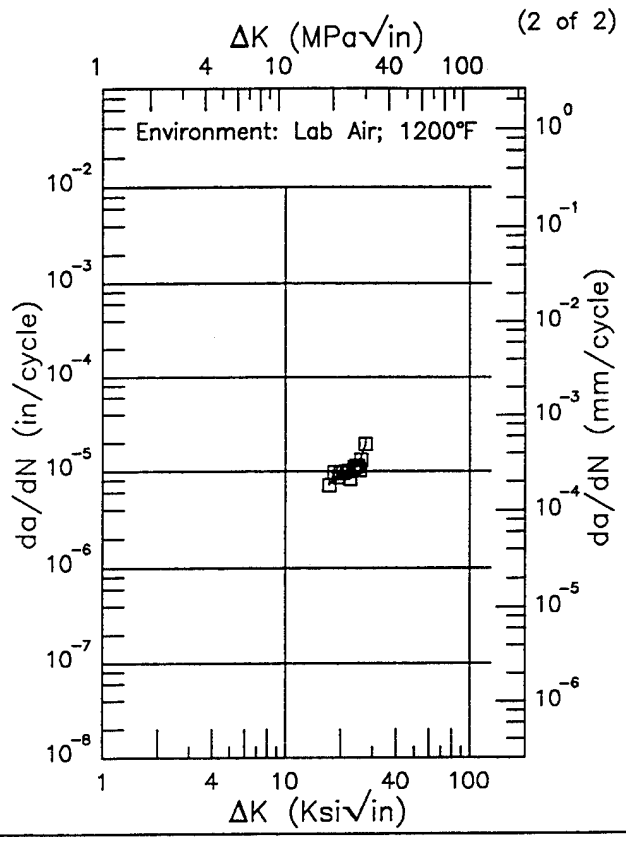
Figure 5.13.3.1.11

WASPALOY E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: −0.5
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.298 in.
Specimen Width: 0.996 − 0.998 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.44 (min)	1.39
20.	5.75
25.	8.69
30.	16.7
31.61 (max)	16.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.29 (min)	7.33
20.	9.57
25.	11.4
27.24 (max)	18.7

RMS % Error	Life Prediction Ratio Summary
9.89	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.50	0. .5 .8 1.25 2.

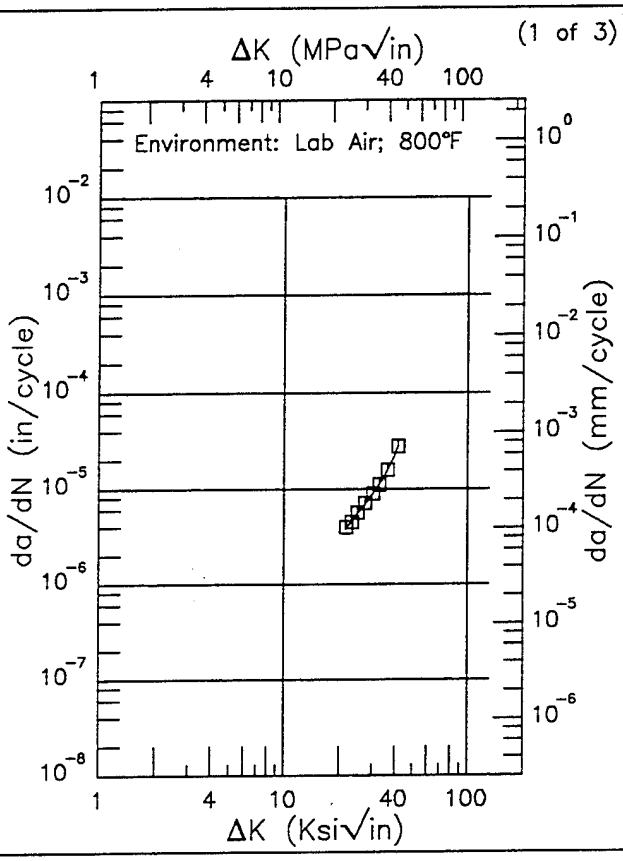
Figure 5.13.3.1.12

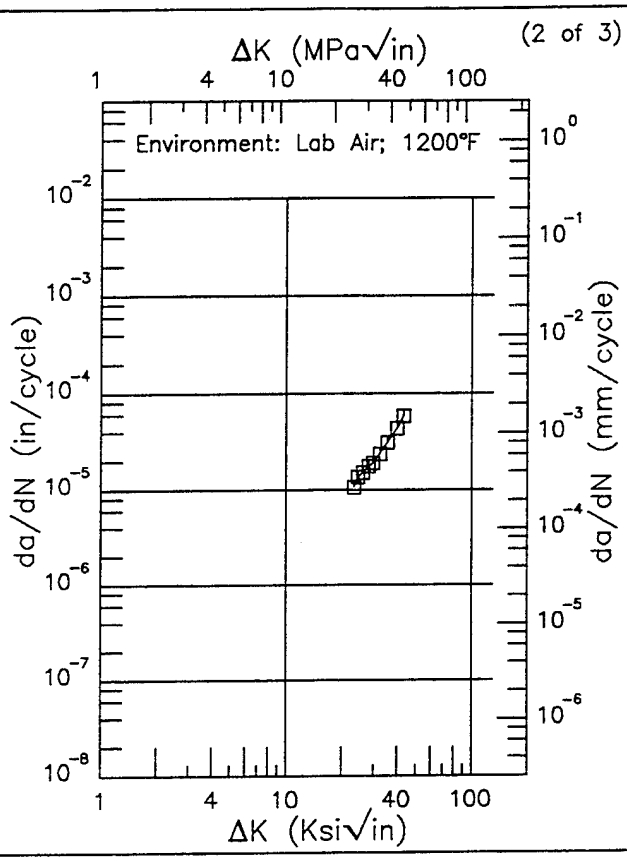
WASPALOY

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.05
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.301 – 0.303 in.
Specimen Width: 0.996 – 0.998 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.55 (min)	3.81
25.	5.56
30.	8.66
35.	13.7
40.	23.2
41.48 (max)	27.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.34 (min)	10.8
25.	14.1
30.	19.8
35.	30.3
40.	44.7
43.07 (max)	58.1

RMS % Error	Life Prediction Ratio Summary
1.89	0. .5 .8 1.25 2.

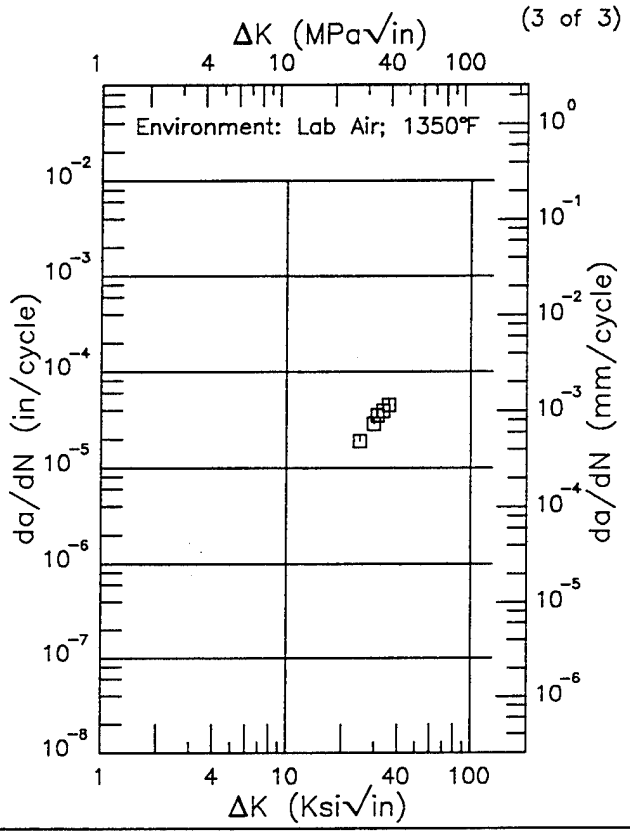
RMS % Error	Life Prediction Ratio Summary
1.81	0. .5 .8 1.25 2.

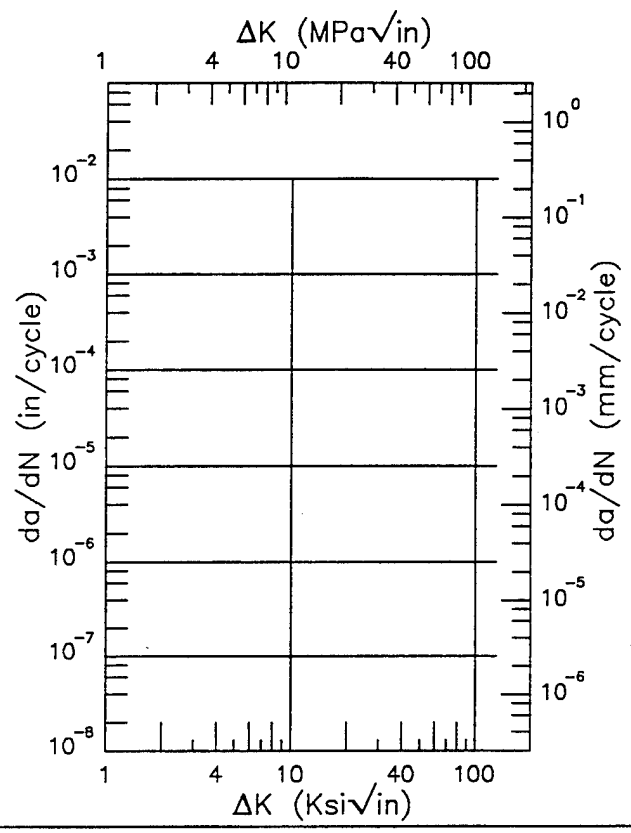
Figure 5.13.3.1.13

WASPALOY E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.05
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.301 – 0.303 in.
Specimen Width: 0.996 – 0.998 in.
Ref: PW001





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

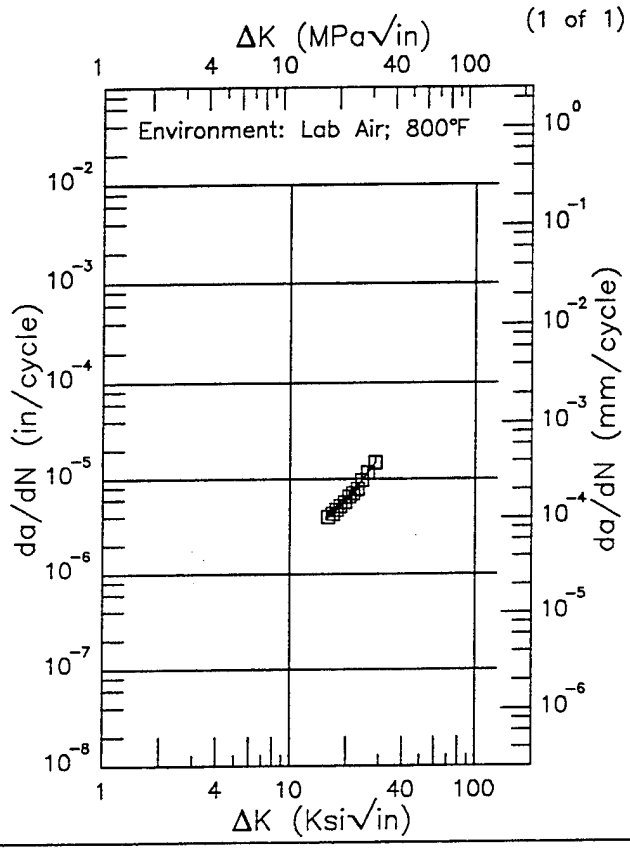
Figure 5.13.3.1.13 (Concluded)

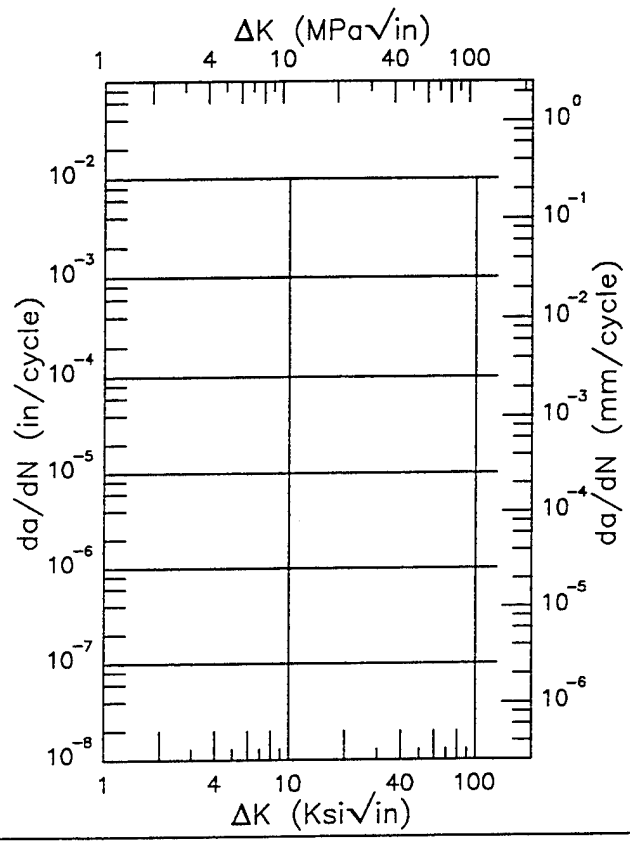
WASPALOY

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.5
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.3 in.
Specimen Width: 0.995 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.92 (min)	3.88
16.	3.92
20.	5.91
25.	10.4
28.39 (max)	14.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

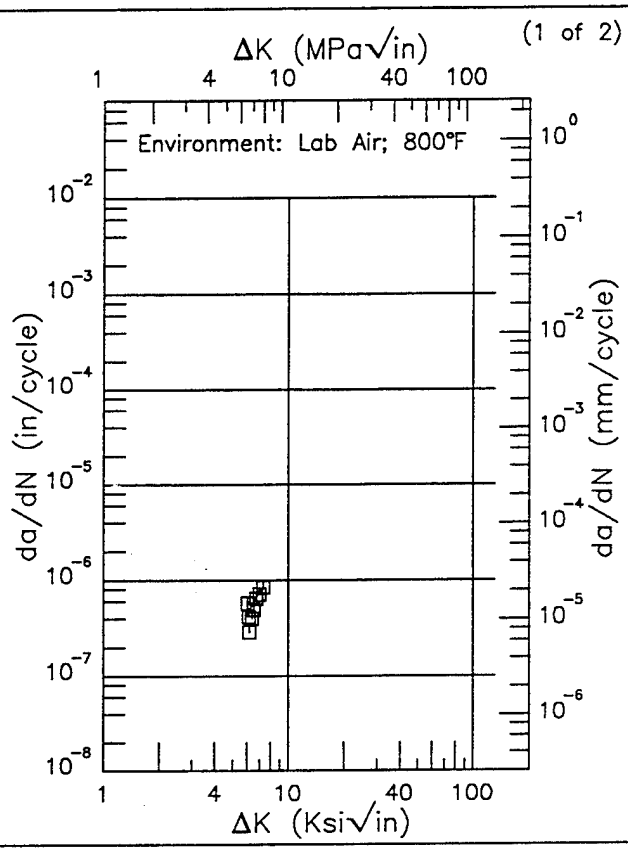
RMS % Error	Life Prediction Ratio Summary
1.98	0. .5 .8 1.25 2.

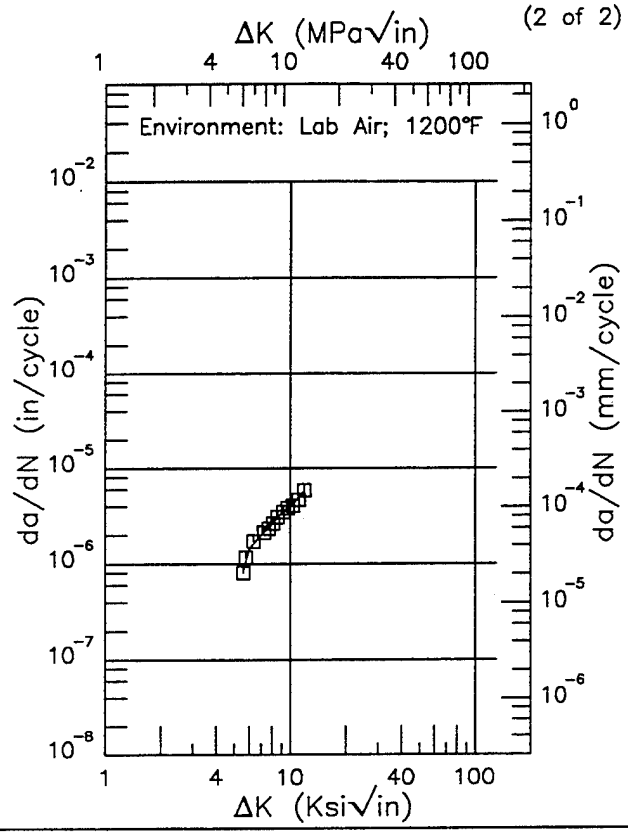
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.13.3.1.14

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation:
Stress Ratio: 0.8
Frequency: 0.2 Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.3 in.
Specimen Width: 0.996 – 0.998 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.02 (min)	0.434
7.	0.765
7.32 (max)	0.791

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.59 (min)	0.861
6.	1.42
7.	2.00
8.	2.60
9.	3.36
10.	3.90
11.87 (max)	5.76

RMS % Error	Life Prediction Ratio Summary
21.44	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
4.25	0. .5 .8 1.25 2.

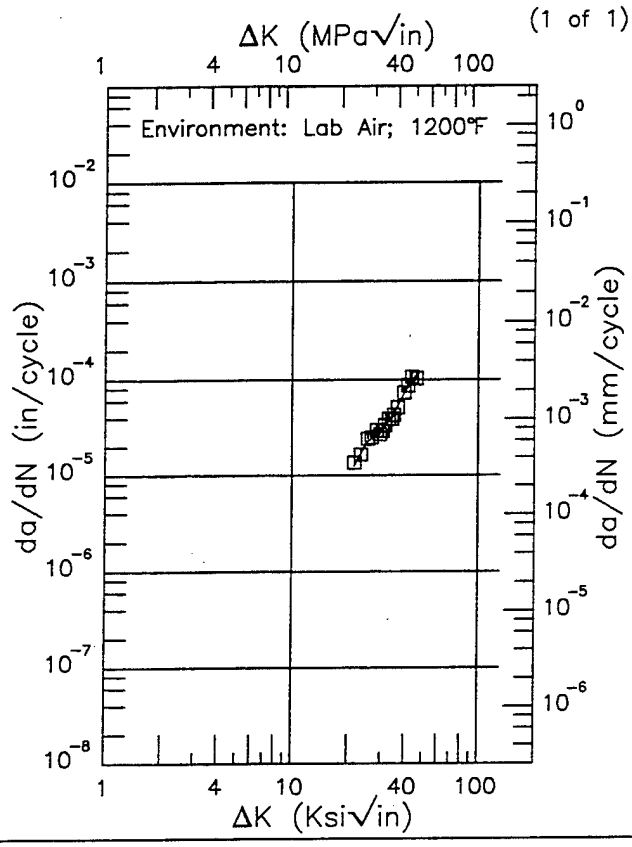
Figure 5.13.3.1.15

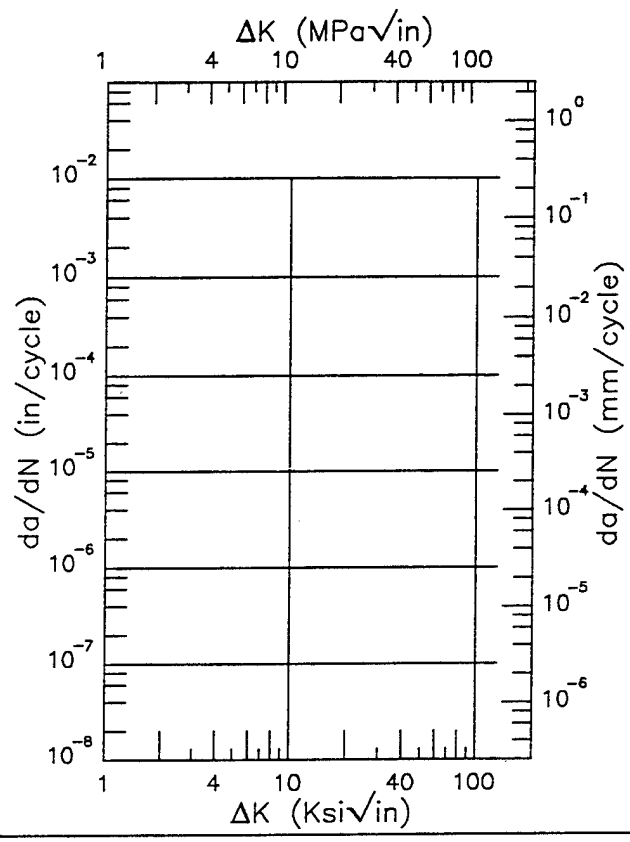
WASPALOY

E

Condition/Ht:
Form: 1.6 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C–R
Stress Ratio: 0.1
Frequency: 0. Hz

Yield Strength: 154 ksi
Ult. Strength: 199.2 ksi
Specimen Thk: 0.299 in.
Specimen Width: 0.998 in.
Ref: PW001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.41 (min)	12.5
25.	22.2
30.	30.0
35.	44.3
40.	75.4
45.95 (max)	109.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.56	0. .5 .8 1.25 2.

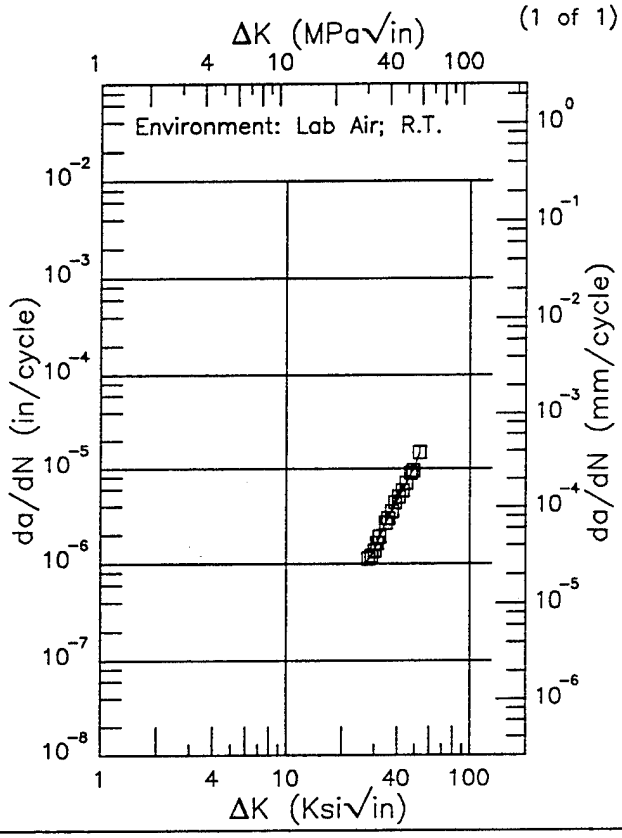
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

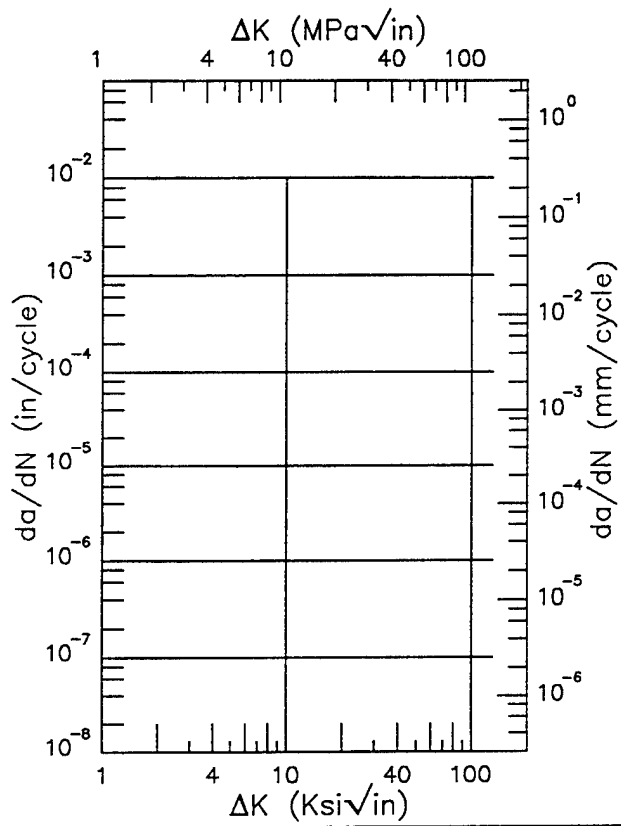
Figure 5.13.3.1.16

WASPALOY E

Condition/Ht: 1850F 2HRS 1350F 6HRS
Form: 1.18 in. Billet
Specimen Type: CT
Orientation:
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 145 ksi
Ult. Strength: 249 ksi
Specimen Thk: 0.125 in.
Specimen Width: 1.25 in.
Ref: UC001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.75 (min)	1.09
30.	1.38
35.	2.75
40.	4.57
50.	10.5
53.11 (max)	14.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.44	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

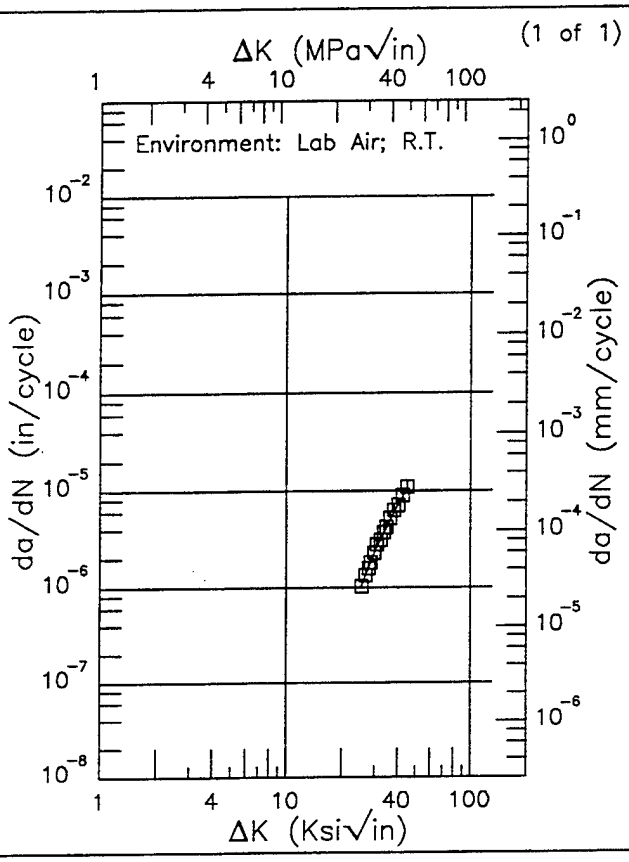
Figure 5.13.3.1.17

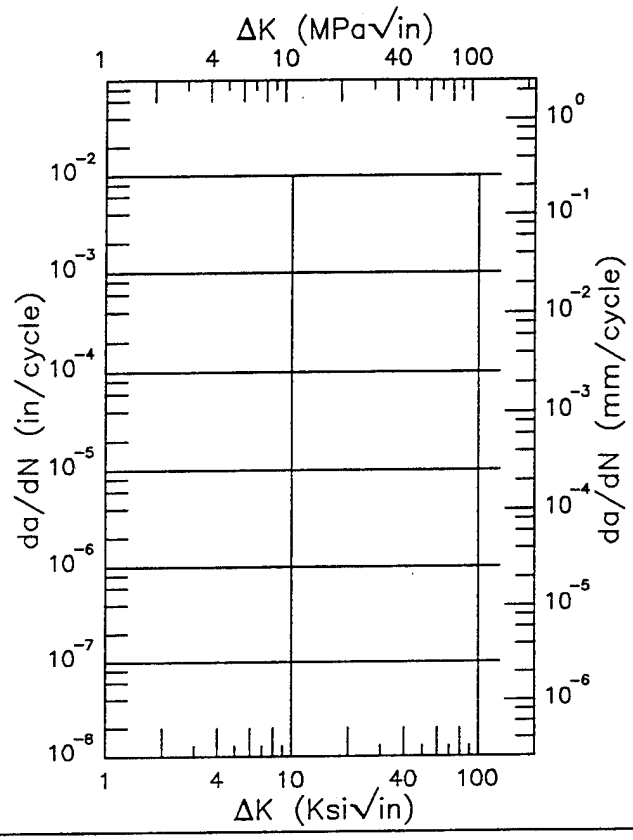
WASPALOY

E

Condition/Ht: 1850F 2HRS 1600F 24HRS (FINE GS
Form: 1.18 in. Billet
Specimen Type: CT
Orientation:
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 111.5 ksi
Ult. Strength: 228 ksi
Specimen Thk: 0.125 in.
Specimen Width: 1.25 in.
Ref: UC001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.47 (min)	1.03
30.	2.33
35.	4.39
40.	7.13
45.09 (max)	10.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.60	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.13.3.1.18

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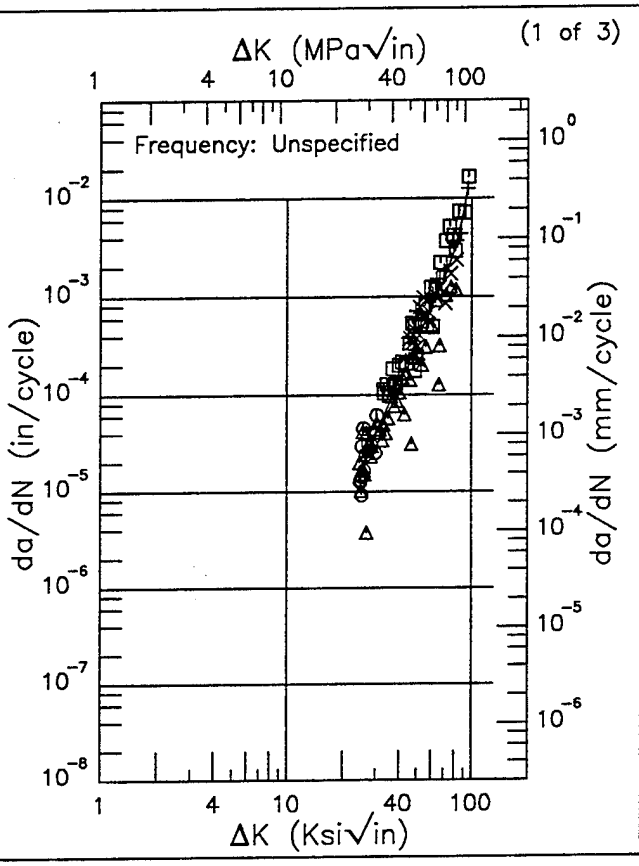
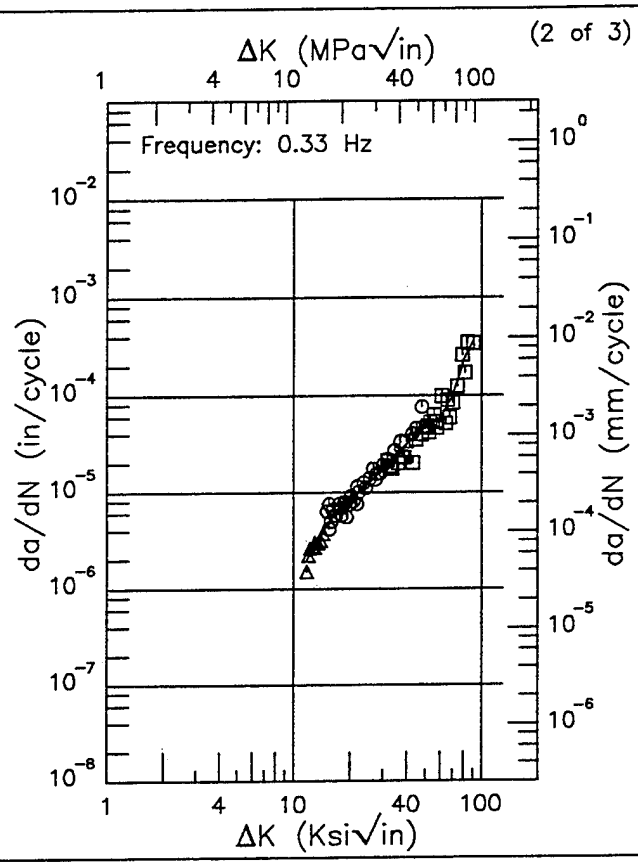
WASPALOY

F

Condition/Ht: 1875F 4HRS OQ 1550F 4HRS AC
Form: Disk
Specimen Type: WOL
Orientation: C–R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 153.7 ksi
Ult. Strength: 199.7 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
24.46 (min)	15.2
25.	16.7
30.	38.2
35.	77.1
40.	140.
50.	360.
60.	745.
70.	1443.
80.	2886.
90.	7179.
95.27 (max)	13261.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.78 (min)	1.94
13.	2.84
16.	5.27
20.	8.42
25.	12.3
30.	17.0
35.	23.5
40.	31.7
50.	47.3
60.	59.0
70.	97.1
80.	222.
89.65 (max)	360.

RMS % Error	Life Prediction Ratio Summary
49.61	0. .5 .8 1.25 2.

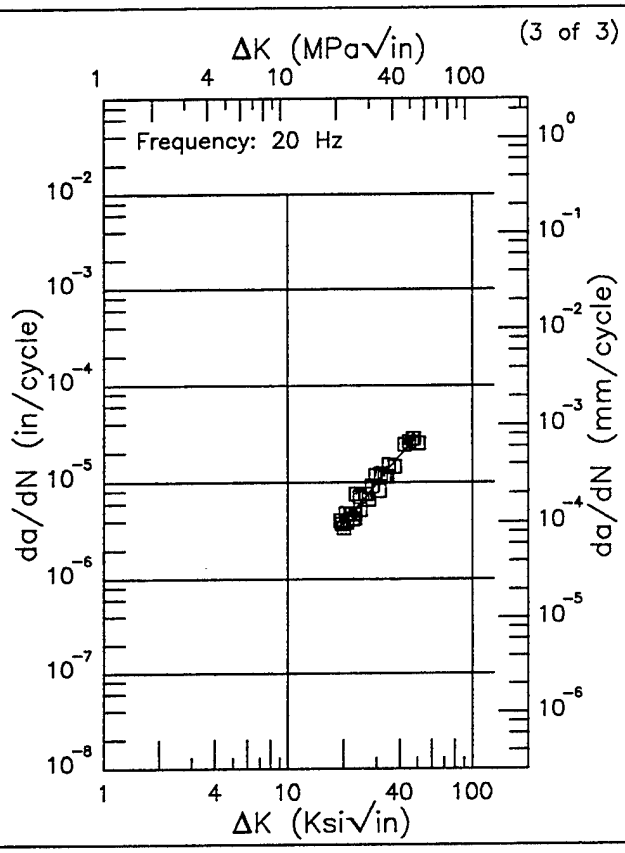
RMS % Error	Life Prediction Ratio Summary
20.49	0. .5 .8 1.25 2.

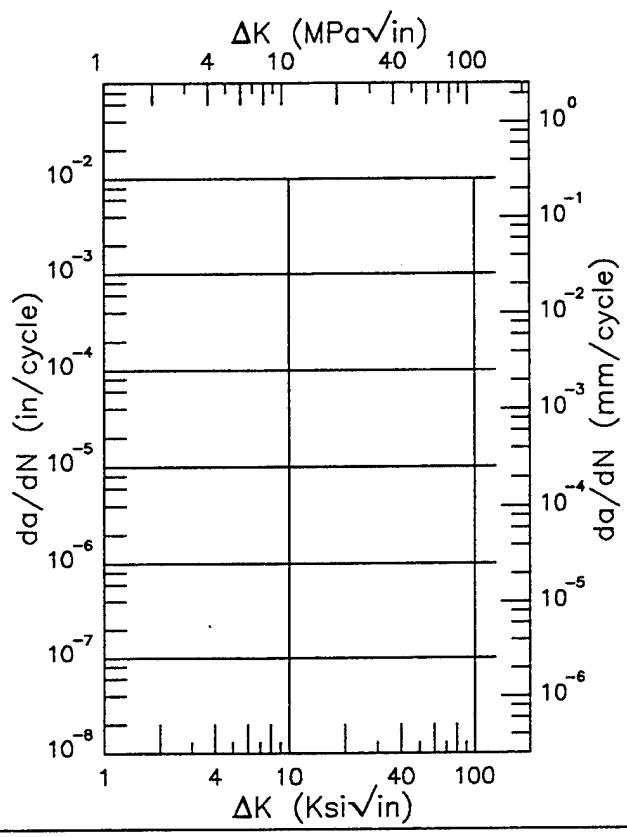
Figure 5.13.3.1.19

WASPALOY F

Condition/Ht: 1875F 4HRS OQ 1550F 4HRS AC
Form: Disk
Specimen Type: WOL
Orientation: C–R
Stress Ratio: 0.05
Environment: LAB AIR;1200°F

Yield Strength: 153.7 ksi
Ult. Strength: 199.7 ksi
Specimen Thk: 0.5 in.
Specimen Width: 2.5 in.
Ref: PW004





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.24 (min)	3.55
20.	3.86
25.	6.37
30.	9.75
35.	13.9
40.	18.8
50.	29.7
50.41 (max)	30.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
14.62	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

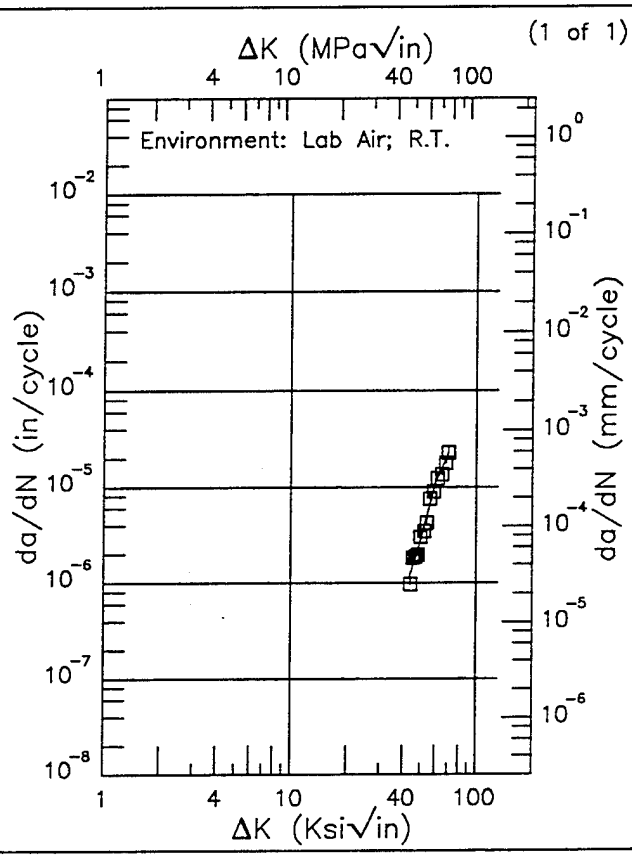
Figure 5.13.3.1.19 (Concluded)

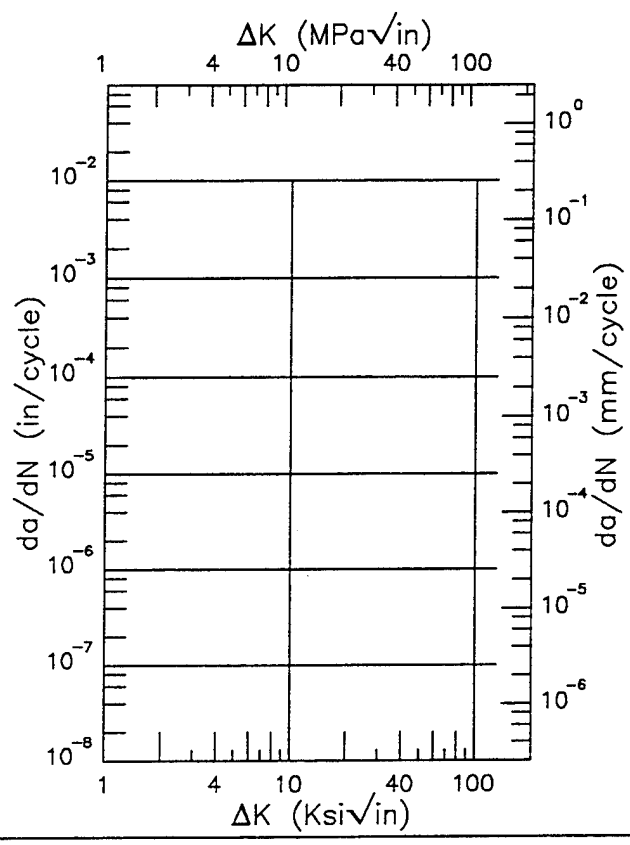
WASPALOY

E

Condition/Ht: 2010F 2HRS 1350F 6HRS
Form: 1.18 in. Billet
Specimen Type: CT
Orientation:
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 95 ksi
Ult. Strength: 230.5 ksi
Specimen Thk: 0.125 in.
Specimen Width: 1.25 in.
Ref: UC001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
43.83 (min)	1.16
50.	2.80
60.	11.0
70.	22.0
70.45 (max)	24.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
12.70	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

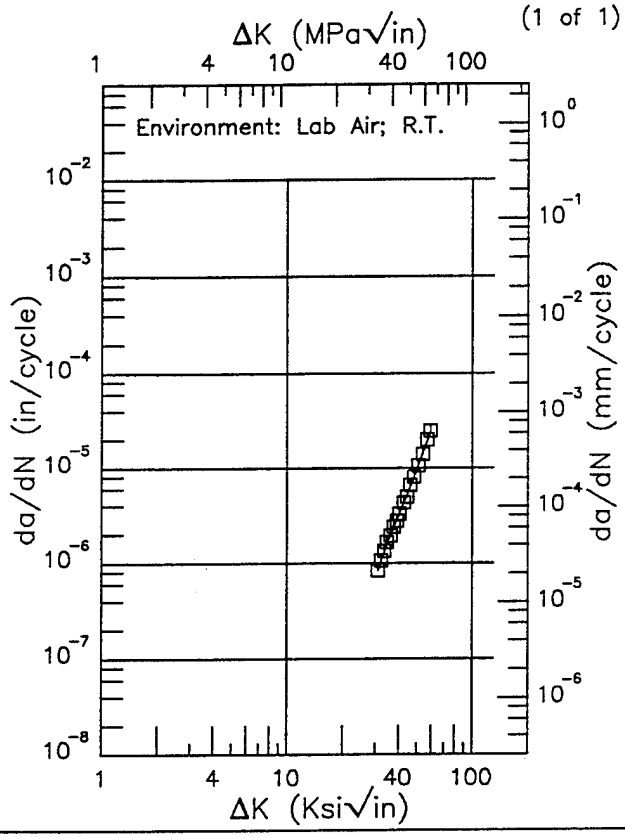
Figure 5.13.3.1.20

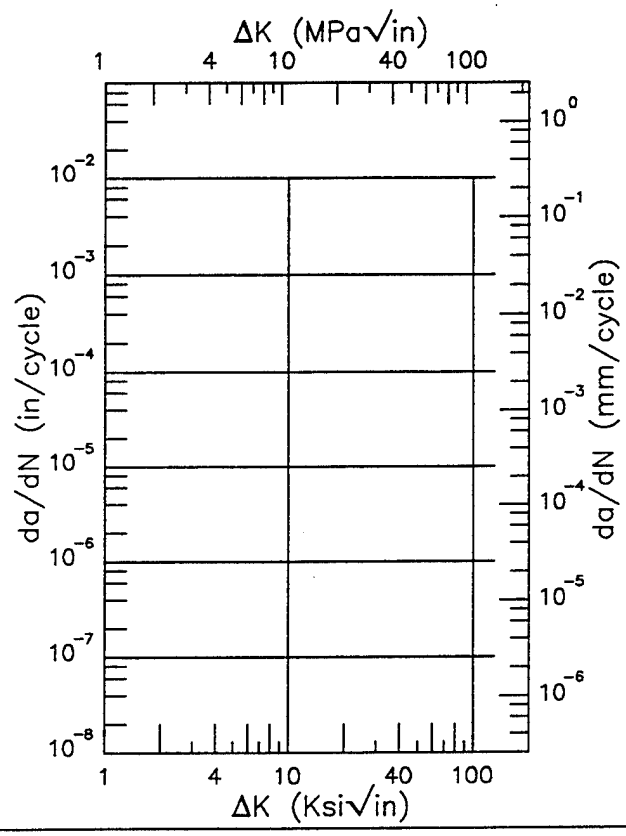
WASPALOY E

Condition/Ht: 2010F 2HRS 1600F 24HRS
Form: 1.18 in. Billet
Specimen Type: CT
Orientation:
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 96.5 ksi
Ult. Strength: 227.5 ksi
Specimen Thk: 0.125 in.
Specimen Width: 1.25 in.
Ref: UC001

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
30.90 (min)	0.827
35.	1.72
40.	3.15
50.	9.56
59.23 (max)	24.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.82	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 5.13.3.1.21

TABLE 5.14

REFERENCES FOR THE NICKEL BASE ALLOY DATA

60578 INCONEL 718 K_c

Christian, J. L., Yang, C. T., and Witzell, W. E., "Physical and Mechanical Properties of Pressure Vessel Materials for Application in a Cryogenic Environment," ASD-TDR-62-258, Part III, General Dynamics/Astronautics (December 1964).

88187 INCONEL 718 K_{Ic}

"Inconel 718 Test Data of September 19, 1973," Schultz Steel Company, South Gate, CA., September 1, 1973.

88579 INCONEL 718 a-vs-N; da/dN

"B-1 Program da/dN Data for Aluminum Alloys," Rockwell International Corporation: Memorandum to H. D. Moran from E. W. Cawthorne, Battelle's Columbus Laboratories, April 3, 1974.

88700 INCONEL 718 K_{Iscc}

Gilbreath, W. P., and Adamson, M. J., "The Stress Corrosion Susceptibility of Several Alloys in Hydrazine Fuels," NASA Technical Note, Report NASA TN D-7604, Ames Research Center, Moffett Field, CA, February 1974.

GE001 INCONEL 718 da/dN
P/M RENE 95 da/dN
RENE 95 (H&F) da/dN

Shanini, V. and Popp, H. G., "Evaluation of Cyclic Behavior of Aircraft Turbine Disk Alloys," General Electric, Evendale, Ohio, Contract No. NAS3-20368, Report No. NASA-CR-159433, June 1978.

GE004 P/M RENE 95 a-vs-N; da/dN

"Argon Environment Testing," Thermal-Mechanical Crack Propagation Program; Data Sheets sent from M. S. Gilbert, General Electric Co., Evendale, Ohio, Contract No. F33615-77-C-5193, November 1980.

GE005 INCONEL 718 da/dN

"Fatigue Crack Growth Rate Data on Inconel 718 Using K_t Bar Specimens from the TF34 DTA Effort;" Data sent from M. S. Gilbert, General Electric Co., Evendale, Ohio, October 1982.

TABLE 5.14 (CONTINUED)

REFERENCES FOR THE NICKEL BASE ALLOY DATA

GE008 INCONEL 718 da/dN
P/M RENE 95 da/dN

Domas, P. A., "Crack Propagation Under Thermal Mechanical Cycling," General Electric Co., Aircraft Engine Group, Evendale, Ohio, Contract No. F33615-77-C-5193, November 1979.

HD003 INCONEL 600 a-vs-N; da/dN

James, L. A., "Fatigue Crack Propagation Behavior of Inconel 600," International Journal of Pressure Vessels and Piping, Vol. 5, 241-259. 1977.

HD005 INCONEL 625 a-vs-N; da/dN

James, L. A., "The Effect of Temperature upon the Fatigue Crack Propagation Behavior of Inconel 625," Report HEDL-TME 77-2, Westinghouse Hanford Co., Richland, WA., March 1977.

HD015 INCONEL 718 a-vs-N; da/dN

James, L. A., "Fatigue Crack Propagation Behavior of Inconel 718," Report HEDL-TME 75-80, Westinghouse Hanford Co., Richland, WA., September 1975.

HD016 INCONEL 718 a-vs-N; da/dN

Mills, W. J., and James, L. A., "Effect of Heat Treatment on Elevated Temperatures Fatigue-Crack Growth Behavior of Two Heats of Alloy 718," ASME Paper 78-WA/FVP-2, December 1978.

HD017 INCONEL 718 a-vs-N; da/dN

James, L. A., "The Effect of Product Form Upon the Fatigue-Crack Growth Behavior in Alloy 718," Journal of Engineering Materials and Technology, Vol. 103, 234-239, 1981.

PW001 WASPALOY a-vs-N; da/dN

Larsen, J. M., Schwartz, B. J., Annis, C. G. Jr., "Cummulative Damage Fracture Mechanics Under Engine Spectra," Pratt and Whitney Aircraft Group, Government Product Division, West Palm Beach, Fla., Report No. AFML-TR-77-4159, January 1980.

TABLE 5.14 (CONCLUDED)

REFERENCES FOR THE NICKEL BASE ALLOY DATA

PW002	IN100	a-vs-N; da/dN

Beyer, J. R., Sims, D. L., and Wallace, R. M., "Titanium Damage Tolerant Design Data for Propulsion Systems," United Technologies Corp., Pratt and Whitney Aircraft Group, West Palm Beach, FL, Report AFML-TR-77-101, Contract No. F33615-75-C-5130, June 1977.

PW003	ASTROLOY 901	da/dN
	IN100	da/dN
	INCOLOY 901	da/dN

Fatigue Crack Growth Rate Data on Titanium and Nickel Base Alloys from B. S. Schwartz, Pratt and Whitney Aircraft Group, Government Product Division, West Palm Beach, FL., July 1982.

PW004	ASTROLOY P/M-H	da/dN
	ASTROLOY P/M-W	da/dN
	IN100 P/M-G	da/dN
	NASA IIB-7 P/M	da/dN
	WASPALOY	da/dN

Cowles, B. A., Sims, D. L., Warren, J. R., "Evaluation of the Cyclic Behavior of Aircraft Turbine Disk Alloys," Pratt and Whitney Aircraft Group, United Technologies Corp., West Palm Beach, Fl., Contract No. NAS3-20367, Report No. NASA CR-159409, October 1978.

PW006	IN100	a-vs-N; da/dN
	WASPALOY	da/dN

Fatigue Crack Growth Rate Data on Nickel Base Alloys from Pratt and Whitney Aircraft Group, Government Product Division, West Palm Beach, FL., July 1982.

RI006	INCONEL 718	K_{Iscc}

Ferguson, R. R., Berryman, R. C., "Fracture Mechanics Evaluation of B-1 Materials," Rockwell International B-1 Division, Los Angeles, CA., Contract No. F33657-70-C-0800, Report No. AFML-TR-76-137, October 1976.

UC001	WASPALOY	da/dN

Lawless, B., et al., "The Effect of Microstructure on the FCP and Overload Behavior of Waspaloy at Room Temperature," Dept. of Materials Science and Metallurgical Engineering, University of Cincinnati, December 1980.

CHAPTER 6
TITANIUM ALLOYS SECTIONS

TABLE 6.0.1

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
BETA	1745F WQ	Sheet						6
	1745F WQ +1095F 1000HR	Sheet						1
	1745F WQ +1095F 16HR	Sheet						2
	1745F WQ +1095F 250HR	Sheet						1
	1745F WQ +1095F 500HR	Sheet						1
	BETA STAB	Sheet						1
BETA-C	STA	Sheet				11		
		Plate	8					
BETA-III	1325F .25HR WQ 925F 8HR	Plate	3					
	1350F 0.5HR WQ 950F 8HR AC	Extrusion	3					
	AGED 1000F 100HR	Unspecified					1	
	AGED 1250F 50HR	Unspecified					1	
	AGED 900F 100HR	Unspecified					1	
	BETA STAB +AGED 900F 1HR	Sheet						7
	STA	Plate				4		
	STA - 1325F WQ 1045F 8HR	Plate	1					
	STA - 1325F WQ 1045F 8HR (ELECTRON BEAM WELD ZONE)	Plate	1					
	STA - 1325F WQ 1045F 8HR (HEAT AFFECTED ZONE)	Plate	1					
	STA 900F 100HR	Unspecified					1	
	STA 900F 40HR	Unspecified					1	

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
BETA-III (Cont'd)	STA 900F 8HR	Unspecified					1	
	STA E.B. WELDMENT (HAZ)	Weldment				2		
	STA E.B. WELDMENT (WELD ZONE)	Weldment				1		
BETA-Ti	BETA STABILIZED	Sheet					1	
CORONA 5	ALPHA-BETA FORGED & LOW ANNEAL & AGE	Forging	1					
IMI-834	1864F 2HRS; OQ TO R.T.; AGE 1161F 2HRS	Disk				11		
Ti-*	1740F 1HR AC	Plate	3					
	STA - 1740F 1HR AC 1000F 8HR AC	Plate	3					
Ti-10-2-3	Unspecified	Unspecified				4		
Ti-4Al-3Mo-1V	MA	Plate						1
Ti-5-2.5 ELI	Unspecified	Disk				73		
Ti-5Al-2.5Sn	ANNEALED	Sheet		75		64		
Ti-6-2-2-2-2	ST	Plate				4		
	STA	Plate				4		
Ti-6-2-4-2	1790F 1HR AC 1100F 8HR AC	Forging				9		
Ti-6-2-4-2 ELI	ANNEAL 1450F 1HR AC	Plate				13		
Ti-6-2-4-6	Unspecified	Extrusion				5		
	1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC	Forging				14		
Ti-6Al-4V	Unspecified	Unspecified				13		1
		Forging						11
	1000F 2HR	Forging					2	
	1300F 1HR AC	Forging		4				

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-4V (Cont'd)	1300F 2HR AC	Extrusion						2
	1450F 1HR AC	Plate	1					
	1550F 4HRS FC 1000F 4HRS ARGON COOLED	Forging				9		
	1700F 4HR FC TO 1400F AC DB THERMAL CYCLE	Plate						9
	1700F 6HR AC 1400F 6HR AC	Forging	12					
	1725F 1HR WQ 1000F 1HR AC (STA)	Extrusion						2
	1725F 1HR WQ 1250F 4HR AC (STOA)	Extrusion						2
	1750F 1.5HR WQ 1050F-1100F 8HR 950F 8HR	Forging						6
	1750F 1000F 2HR AC	Forging						2
	1750F 1HR FC TO 1100F	Plate	3					
	1750F 1HR FC TO RT	Plate	4					
	1750F 1HR WQ 1000F 4HR	Forging	15					
	1750F 2HR FC TO 900F AT 100F/HR AC	Forging	2					
	1750F 2HR WQ 1000F 2HR AC 1300F 2HR AC STA	Plate	2					
	1750F 4HRS ARGON COOLED	Forging				9		
	1750F WQ 1000F 8HR 1000F (ALPHA+BETA)	Forging						4
	1775F 1HR WQ 1675F 1HR WQ 1000F 4HR AC	Disk				2		
	1775F 1HR WQ 1675F 1HR WQ 1000F-1200F 2-8HR AC	Disk				17		
	1790F 1.5HR WQ 1160F 8HR + 1025F 8HR AC	Sheet						2
	1900F 0.5HR AC 1350F 2HRS AC	Plate	1					
	1950F 4HRS WQ 1000F 4HRS ARGON COOLED	Forging				7		

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-4V (Cont'd)	AB FORGED-MA ALPHA-BETA FORGED MA	Forging	12					
	AB FORGED-RA ALPHA-BETA FORGED RA 1700F 4HR FC	Forging	8					
	ALPHA-BETA FORGE-ANNEALED	Forging				3		
	ALPHA-BETA FORGED	Forging						3
	ANNEALED	Sheet		19				
		Forging	17			19		
		Extrusion	19			22		
		Billet	2			2		
	ANNEALED 1000F 2HR AC	Billet	2					
	ANNEALED 1300F 4HR AC	Forging	22					
	ANNEALED 1375F 3HR AC	Plate	2					
	ANNEALED 2200F 2HR	Forging	5					
	ANNEALED AT 1375F 3HRS AC	Plate				2		
	AS RECEIVED	Forged Bar	35					
	AS RECEIVED PROBABLY MA	Plate						1
	AS RECEIVED-AB (ALPHA-BETA FORGED)	Forged Bar	2					
	AS WELDED E.B. WELDMENT (HAZ)	Weldment				1		
	AS WELDED E.B. WELDMENT (WELD ZONE)	Weldment				1		
	B FORGED BETA FORGED REHEATED TO 1950F DRAWN TO SIZE	Forged Bar	4					
	B FORGED-MA BETA FORGED MA	Forging	2					
	B FORGED-MA BETA FORGED MA 1300F 2HR AC	Forging	8					

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-4V (Cont'd)	BA	Sheet				6		
		Plate				21		
		Forging				20		
	BB AB FIN-30MA BETA BLOCKED	Forging	2					
	BB AB FIN-MA BETA BLOCKED	Forging	4					
	BB AB FIN-RA BETA BLOCKED	Forging	4					
	BB AB FIN10STO BETA-BLOCKED	Forging	3					
	BB AB FIN30STO BETA-BLOCKED	Forging	3					
	BB B FIN-10MA BETA BLOCKED	Forging	3					
	BB B FIN10STOA BETA BLOCKED	Forging	3					
	BETA ANNEALED	Plate	6					
	BETA ANNEALED PLATE EB WELDED THEN BETA ANN	Plate	2					
	BETA FORGED	Forging						3
	BETA PROCESSED - MA	Sheet				1		
		Plate	3			6		
	DB	Plate	7			4		
		Billet	7					
	DB + 2DBTC	Plate				2		
	DB + 4DBTC	Plate				1		
	DB + TR	Plate				1		
	DBA	Billet	22					

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-4V (Cont'd)	DBT + PC	Plate				1		
	DBTC	Plate				12		
	DBTC(RA)	Plate				1		
	EB WELD STRESS RELIEVED (HEAT AFFECTED ZONE)	Weldment					2	
	EB WELD STRESS RELIEVED (WELD ZONE)	Weldment					2	
	FINISH ROLLED 1440F	Plate						11
	GTA WELD POSTWELD 1100F 2HR (HEAT AFFECTED ZONE)	Plate						5
	GTA WELD POSTWELD 1100F 2HR (WELD ZONE)	Plate						1
	GTA WELD POSTWELD 1200F 1HR (HEAT AFFECTED ZONE)	Plate						2
	GTA WELD POSTWELD 1400F 1HR (HEAT AFFECTED ZONE)	Plate						2
	HIP 1650F 15 KSI	Casting				3		
	MA	Unspecified				2		
		Sheet		29		9	16	13
		Plate	13	13		22	2	2
		Forging				10		
		Extrusion	11			25		
	MA 10-20%ALPHA 10 TO 20%PRIMARY ALPHA MA 1300F 2HR AC	Forging	3					
	MA 1300F 2HR AC	Forging	10					
		Billet	3					

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-4V (Cont'd)	MA 1300F 2HRS AC	Unspecified				7		
		Disk				5		
	MA 40-50%ALPHA 40 TO 50%PRIMARY ALPHA MA 1300F 2HR AC	Forging	3					
	MA COARSE GRAIN 1300F 2HR AC	Forging	5					
	MA FINE GRAIN 1300F 2HR AC	Forging	6					
	MINUTEMAN CASING	Plate						1
	RA	Plate	46			97		21
		Forging	100			13		8
	RA(FAST COOLED)	Plate				1		
	SOL TREATED 1050F 4+4 HR	Forging						2
	SOL TREATED 1050F 4HR WELDED 1050F 4HR	Forging						2
	STA	Plate	3					
		Forging	1					
	STOA	Plate				1		
		Forging	1					
	STOA - 1750F 1HR WQ 1300F 2HR AC	Forging	3					
	STRESS RELIEVED E.B. WELDMENT (HAZ)	Weldment				14		
	STRESS RELIEVED E.B. WELDMENT (WELD ZONE)	Weldment				6		
	WELDED & STRESS RELIEVED 1100F 2HRS (HAZ)	Weldment				2		

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-4V ELI	1800F 1HR HELIUM COOL	Plate						1
	ANNEALED	Sheet		15				
		Forging	6			5		
	BA	Plate				36		
	RA	Plate	6			28		
Ti-6Al-6V-2Sn	1300F 2HR	Forging					2	
	1650F 1HR WQ	Forging	8					
	1675F 2HR AC 1600F 1HR FC	Plate	2					
		Forging	2					
		Forged Bar	2					
	ANNEAL - COARSE GRAIN - 1350F 2HR AC	Forging	6					
	ANNEAL - FINE GRAIN - 1350F 2HR AC	Forging	6					
	ANNEALED 10-20 10-20% PRIMARY ALPHA ANNEALED 1350F 2HR AC	Forging	2					
	ANNEALED 40-50 40-50% PRIMARY ALPHA ANNEALED 1350F 2HR AC	Forging	2					
	BA	Plate				3		
	BB AB FIN-10 BETA BLOCKED ALPHA-BETA FINISHED 10% REDUCTION SOLUTION	Forging	2					
	BB AB FIN-10MA BETA BLOCKED ALPHA-BETA FINISHED 10% REDUCTION MA	Forging	3					
	BB AB FIN-30 BETA BLOCKED ALPHA-BETA FINISHED 30% REDUCTION SOLUTION	Forging	3					
	BB AB FIN-30MA BETA BLOCKED ALPHA-BETA FINISHED 30% REDUCTION MA	Forging	3					

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-6V-2Sn (Cont'd)	BB B FIN-10 BETA BLOCKED BETA FINISHED 10% REDUCTION SOLUTION TREATED & OVERAGED 1650F 1HR WQ 1300F 2HR AC	Forging	2					
	BETA ANNEAL 1810F 1HR ARGON COOL	Plate	3					
	BETA ANNEAL & STOA-1800F 0.5HR AC 1575F 0.5HR WQ 1050F 8HR AC	Plate	2					
	BETA ANNEALED	Plate	1					
	BF AB FOR-ANN BETA FLECTED ALPHA-BETA FORGED ANNEALED 1350F 2HR AC	Forging	3					
	BF B FOR-ANN BETA FLECTED BETA FORGED ANNEALED 1350F 2HR AC	Forging	3					
	BF LAB FOR-ANN BETA FLECTED LOW ALPHA-BETA FORGED (1500F) ANNEALED 1350F 2HR	Forging	3					
	BF LAB FOR-ANN BETA FLECTED LOW ALPHA-BETA FORGED (1500F) ANNEALED 1350F 2HR AC	Forging	3					
	DUPLEX ANNEAL	Plate	3					
	MA	Unspecified				1		
		Plate	6					
		Forging	8			10		
		Extrusion				2		
		Forged Bar	1					
		Billet	4					
	MA 1000F 2HR AC	Billet	2					

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al-6V-2Sn (Cont'd)	RA	Unspecified				2		
		Plate	1					
	STA - 1600F 0.5HR WQ 1000F 6HR AC	Forging	9					
	STA - 1650F 0.5HR WQ 1050F 24HR AC	Forging	7					
	STA - 1675F 0.25HR WQ 1100F 4HR AC	Plate	3					
	STOA	Plate				14		
	STOA - 1600F 1.5HR WQ 1250F 6HR AC	Extrusion	3					
	STOA - 1650F 1HR WQ 1300F 2HR AC	Forging	2					
	STOA - 1700F 1HR WQ 1400F 1HR AC	Plate	7					
		Billet	8					
Ti-6Al-6V-2.5Sn	Unspecified	Plate						1
	1000F 2HR AC	Forging						1
	1300F 2HR AC	Forging						1
	1550F 1HR WQ 900F 4HR AC	Plate						1
Ti-6Al2Sn4Zr6Mo	50% PRIMARY ALPHA	Forging	1					
	BETA PROCESSED	Forging	1					
	BU B FIN-10MA BETA UPSET BETA FINISHED 10% PRIMARY ALPHA MA 1300F 1HR AC	Forging	3					
	BU B FIN-10STA BETA UPSET BETA FINISHED 10% PRIMARY ALPHA SOLUTION TREATED &	Forging	3					
	BU B FIN-10STO BETA UPSET BETA FINISHED 10% PRIMARY ALPHA SOLUTION TREATED & OVERAGED 1625F 1HR AC 1300F 1HR AC	Forging	2					

TABLE 6.0.1 (CONTINUED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-6Al2Sn4Zr6Mo (Cont'd)	BU B FIN-50MA BETA UPSET BETA FINISHED 50% PRIMARY ALPHA MA 1300F 1HR AC	Forging	2					
	BU B FIN-50STA BETA UPSET BETA FINISHED 50% PRIMARY ALPHA SOLUTION TREATED & AGED 1625F 1HR AC 1100F 8HR AC	Forging	2					
	BU HABFIN10STA BETA UPSET HI ALPHA-BETA FINISHED 10% REDUCTION SOLUTION	Forging	3					
	BU HABFIN30STA BETA UPSET HI ALPHA-BETA FINISHED 30% REDUCTION SOLUTION TREATED	Forging	3					
	BU LABFIN10STA BETA UPSET LO ALPHA-BETA FINISHED 10% REDUCTION SOLUTION TREA	Forging	3					
	STA - 1625F 2HR AC 1100F 8HR AC	Forging	6					
Ti-8Al-1Mo-1V	Unspecified	Unspecified					5	
		Sheet				2	1	1
		Plate						1
	1520F 1HR WQ	Plate					12	53
	1675F 1HR AC 1075F 8HR AC 1000F 2HR AC	Plate						1
	1700F 1HR AC 1200F 2HR WQ	Plate						1
	1725F FC 1200F 3HR WQ	Plate					8	
	1775F 0.5HR FC TO 1200F 1200F 0.5HR AC 1200F 3HR ARGON QUENCH	Plate						7
	1825F 1HR AC	Plate						1
	1825F 1HR AC 1350F 2HRS AC	Unspecified				4		
	1830F 1HR WQ 1100F 8HRS AC	Forging	1			3		
	2000F 0.5HR AC	Plate						1

TABLE 6.0.1 (CONCLUDED)

AVAILABLE DATA FOR TITANIUM ALLOYS

Alloy	Condition/ Heat Treatment	Product Form	K_{Ic}	K_c	R Curve	da/dN	da/dt	K_{Iscc}
Ti-8Al-1Mo-1V (Cont'd)	DA	Sheet		25		22		
	MA	Sheet				2	1	
		Plate					2	8
	MA 1435F 8HR FC	Sheet						2
	VAC ANNEALED	Plate						8
Ti-Mo8V2Fe3Al	1475F 1.5HR WQ 1000F 8HR AC	Extrusion	3					
	STA REAGED AT 1100F 6HR	Plate	6					
Ti5Al2.5Sn ELI	ANNEALED	Forging	13					
	ANNEALED (ES)	Forging	6					
	ANNEALED (IS)	Forging	5					
Ti6Al6V2Sn ELI	1600F 1HR WQ 1050F 4HR AC	Plate	6					
	1650F 1HR WQ 1125F 4HR AC	Plate	6					

TABLE 6.0.2

PLANE STRAIN FRACTURE TOUGHNESS VALUES OF TITANIUM ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Range of Product Thickness (in.)	K_{Ic} ($Ksi\sqrt{in}$)											
				Specimen Orientation											
				L-T				T-L				S-L			
				Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev
BETA-C	STA	Plate	2.50	1.00	3	44.1	1.4	1.00	2	43.9	0.6	---	---	---	---
BETA-III	1325F .25HR WQ 925F 8HR	Plate	0.80	0.75	3	49.8	1.2	---	---	---	---	---	---	---	---
TI-*	1740F 1HR AC	Plate	0.62-1.00	0.63	3	61.6	1.6	---	---	---	---	---	---	---	---
	STA - 1740F 1HR AC 1000F 8HR AC	Plate	0.62	0.62	3	55.3	1.5	---	---	---	---	---	---	---	---
Ti-6Al-4V	1700F 6HR AC 1400F 6HR AC	Forging	1.40	1.25	6	75.9	4.2	1.28	6	81.2	5.8	---	---	---	---
	1750F 1HR FC TO 1100F	Plate	1.50	---	---	---	---	1.50	2	91.5	2.1	---	---	---	---
	1750F 1HR FC TO RT	Plate	1.50	1.50	2	71.8	3.2	1.50	2	91.6	1.3	---	---	---	---
	1750F 1HR WQ 1000F 4HR	Forging	3.00	---	---	---	---	2.00	3	79.3	4.9	---	---	---	---
	1750F 2HR WQ 1000F 2HR AC 1300F 2HR AC STA	Plate	0.62	0.63	2	41.4	2.3	---	---	---	---	---	---	---	---
	AB FORGED-MA ALPHA-BETA FORGED MA	Forging	2.25	---	---	---	---	1.00	4	35.4	2.7	---	---	---	---
	ANNEALED	Forging	1.50-3.00	1.50	4	70.8	15.9	1.49	6	67.3	13.6	---	---	---	---
		Extrusion	1.50-4.00	1.50	5	82.6	5.3	1.49	6	85.2	6.5	---	---	---	---
		Billet	6.00	1.25	2	79.6	9.6	---	---	---	---	---	---	---	---
	ANNEALED 1000F 2HR AC	Billet	2.30	1.25	2	50.9	0.6	---	---	---	---	---	---	---	---
	ANNEALED 1300F 4HR AC	Forging	2.30	0.75	3	58.1	1.2	0.75	3	62.2	3.0	0.75	2	68.1	1.0

TABLE 6.0.2 (CONTINUED)

PLANE STRAIN FRACTURE TOUGHNESS VALUES OF TITANIUM ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Range of Product Thickness (in.)	K_{Ic} ($Ksi\sqrt{in}$)											
				Specimen Orientation											
				L-T				T-L				S-L			
				Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev
Ti-6Al-4V (Cont'd)	ANNEALED 1375F 3HR AC	Plate	2.75	1.25	2	60.4	5.5	---	---	---	---	---	---	---	---
	AS RECEIVED	Forged Bar	%-1.00-3.50	0.56	14	57.1	10.4	0.50	21	54.9	10.8	---	---	---	---
	B FORGED BETA FORGED REHEATED TO 1950F DRAWN TO SIZE	Forged Bar	2.25-3.50	---	---	---	---	1.00	4	42.6	4.3	---	---	---	---
	B FORGED-MA BETA FORGED MA 1300F 2HR AC	Forging	2.00	1.00	3	70.6	4.9	1.00	3	71.0	0.4	1.00	2	73.9	2.5
	BETA PROCESSED - MA	Plate	1.00-3.00	1.50	3	94.9	4.8	---	---	---	---	---	---	---	---
	DBA	Billet	0.62-3.50	0.98	9	68.2	9.7	0.68	13	64.2	11.8	---	---	---	---
	MA	Plate	1.00-2.00	1.24	3	74.4	32.6	1.00	7	91.6	24.4	---	---	---	---
		Extrusion	1.80-4.00	1.47	5	83.5	3.1	1.50	6	87.5	4.1	---	---	---	---
	MA 1300F 2HR AC	Forging	2.00-4.50	1.00	4	50.9	6.9	1.00	3	49.5	3.9	1.00	3	43.6	5.8
		Billet	2.30	1.25	3	84.0	3.4	---	---	---	---	---	---	---	---
	RA	Plate	1.00-2.50	---	22	82.8	7.8	---	22	80.8	10.8	---	---	---	---
		Forging	1.20-6.70	1.25	41	83.6	5.5	1.25	50	83.9	6.9	1.43	9	88.9	3.2
	STA	Plate	0.62	---	---	---	---	0.63	3	42.6	2.0	---	---	---	---
Ti-6Al-4V ELI	ANNEALED	Forging	3.00	2.00	3	83.5	1.3	2.01	3	84.3	0.4	---	---	---	---
	RA	Plate	3.00	2.00	3	76.1	4.0	2.00	3	76.8	0.7	---	---	---	---

TABLE 6.0.2 (CONCLUDED)

PLANE STRAIN FRACTURE TOUGHNESS VALUES OF TITANIUM ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Range of Product Thickness (in.)	K_{Ic} ($Ksi\sqrt{in}$) Specimen Orientation											
				L-T				T-L				S-L			
				Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev	Min Spec Thk	n	Mean	Std Dev
Ti-6Al-6V-2Sn	BETA ANNEAL 1810F 1HR ARGON COOL	Plate	0.50	---	---	---	---	0.45	3	54.3	2.0	---	---	---	---
	BETA ANNEAL & STOA-1800F 0.5HR AC 1575F 0.5HR WQ 1050F 8HR AC	Plate	0.62	0.63	2	50.1	1.8	---	---	---	---	---	---	---	---
	DUPLEX ANNEAL	Plate	0.50-1.00	---	---	---	---	0.50	3	65.1	2.0	---	---	---	---
	MA	Plate	0.50-1.00	---	---	---	---	0.49	4	35.0	5.2	---	---	---	---
		Forging	3.80	1.00	3	58.6	2.7	---	---	---	---	---	---	---	---
		Billet	2.20	1.24	4	52.3	6.4	---	---	---	---	---	---	---	---
	MA 1000F 2HR AC	Billet	2.20	1.25	2	57.1	2.2	---	---	---	---	---	---	---	---
	STA - 1600F 0.5HR WQ 1000F 6HR AC	Forging	3.80	1.01	3	30.8	0.7	---	---	---	---	---	---	---	---
	STA - 1675F 0.25HR WQ 1100F 4HR AC	Plate	1.25	---	---	---	---	0.50	3	34.1	3.8	---	---	---	---
	STOA - 1700F 1HR WQ 1400F 1HR AC	Plate	0.38	0.38	3	42.9	1.3	0.38	4	46.1	3.1	---	---	---	---
		Billet	%12.00	1.02	4	62.8	6.9	1.02	4	57.0	3.7	---	---	---	---
Ti-Mo8V2Fe3Al	STA REAGED AT 1100F 6HR	Plate	1.00	1.00	3	54.0	1.0	0.99	3	53.9	1.0	---	---	---	---
Ti6Al6V2Sn ELI	1600F 1HR WQ 1050F 4HR AC	Plate	1.00	0.25	3	29.8	0.5	---	---	---	---	---	---	---	---
	1650F 1HR WQ 1125F 4HR AC	Plate	1.00	0.25	2	34.0	3.5	---	---	---	---	---	---	---	---

TABLE 6.0.3.1

PLANE STRESS AND TRANSITIONAL FRACTURE TOUGHNESS OF TITANIUM ALLOYS (WITHOUT BUCKLING CONSTRAINTS)

Alloy	Condition/ Heat Treatment	Test Temp (°F)	Specimen		Yield Strength (Ksi)	K_c ($Ksi\sqrt{in}$) Specimen Thickness (in.) n - Sample size μ - Mean σ - Standard Deviation											
			Orient	Width (in.)		0.02			0.04			0.05					
						n	μ	σ	n	μ	σ	n	μ	σ	n	μ	σ
Ti-5Al-2.5Sn	ANNEALED	-423.	L-T	3.0	203.5	6	115.6	4.9	---	---	---	---	---	---			
				6.0	203.5	9	109.4	6.6	---	---	---	---	---	---			
				12.0	203.5	14	107.0	9.0	---	---	---	---	---	---			
				16.0	193.3	2	97.1	9.6	---	---	---	---	---	---			
			T-L	12.0	207.3-211.8	2	107.7	16.0	2	147.6	28.9	---	---	---			
		-320.	L-T	16.0	171.2	2	141.8	2.7	---	---	---	---	---	---			
Ti-6Al-4V	MA	-110.	T-L	8.0	163.3-164.3	---	---	---	---	---	---	2	159.4	7.5			
		R.T.	L-T	24.0	133.8-136.7	---	---	---	---	---	---	6	196.4	19.9			
Ti-6Al-4V ELI	ANNEALED	R.T.	L-T	18.0	136.0	5	161.6	6.5	---	---	---	---	---	---			
Ti-8Al-1Mo-1V	DA	R.T.	L-T	12.0	135.5	3	111.7	15.0	---	---	---	---	---	---			
				20.0	133.6	---	---	---	---	---	---	4	220.5	15.8			

TABLE 6.0.3.2

PLANE STRESS AND TRANSITIONAL FRACTURE TOUGHNESS OF TITANIUM ALLOY (WITH BUCKLING CONSTRAINTS)

Alloy	Condition/ Heat Treatment	Test Temp (°F)	Specimen		Yield Strength (Ksi)	K_c ($Ksi\sqrt{in}$)											
						Specimen Thickness (in.) n - Sample size μ - Mean σ - Standard Deviation											
			Orient	Width (in.)		0.400											
						n	μ	σ	n	μ	σ	n	μ	σ	n	μ	σ
Ti-6Al-4V	1300F 1HR AC	R.T.	L-T	6.0	147.1	2	144.3	3.7									

TABLE 6.0.4.1

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: Unspecified **STRESS RATIO: 0.1 - 0.7** **FREQUENCY: 0.1 - 30. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-6Al-4V	BA	SHEET	0.1	10			4.66			
			0.1	10			1.84	14.44	122.21	
			0.3	10				14.91	210.93	
			0.7	10			3.87	26.35		
	HIP 1650F 15 KSI	CASTING	0.1	0.1-20			0.16	5.23		
	Unspecified	Unspecified	0.1	30			1.33			

TABLE 6.0.4.2

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: L-T **STRESS RATIO: -1.0 - 0.8** **FREQUENCY: 0.1 TO 55. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-10-2-3	Unspecified	Unspecified	0.05	10		0.48				
			0.1	10			1.16			
			0.33	10		0.65				
Ti-5Al-2.5Sn	ANNEALED	SHEET	0.1	30				11.56	123.8	
			0.1	50				11.69		
			0.67	55		0.15	2.17			
Ti-6-2-4-2 ELI	ANNEAL 1450F 1HR AC	PLATE	-0.3	9				21.3		
			0.1	9				13.49		
			0.5	9				43.6		
Ti-6-2-4-6	Unspecified	EXTRUSION	0.1	20			0.82	9.45		
Ti-6Al-4V	ALPHA-BETA FORGE-ANNEALED	FORGING	0.1	30			1.02			
			0.1	30		0.05				
			0.1	30		0.05				
	ANNEALED	FORGING	-1	5			0.87	10.33		
			0.1	5			0.29	9.53		
			0.1	15				11.12		

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: L-T **STRESS RATIO: -1.0 - 0.8** **FREQUENCY: 0.1 TO 55. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-6Al-4V (Cont'd)	ANNEALED (Cont'd)	FORGING (Cont'd)	0.1	20			0.38			
			0.4	10		0.05	1.32	16.33		
			0.4	20		0.02	1.09	17.6		
			0.8	15		0.07				
		EXTRUSION	-1	5			0.41	7.29		
			0.1	8			0.34	11.63		
			0.1	15				8.68	242.97	
			0.1	20			0.18			
			0.4	15		0.03	0.57	16.54		
			0.8	10		0.13	1.68			
			0.8	15		0.1	1.37			
			0.8	30		0.08	1			
		BILLET	0.02	10-20			0.27	11.05		
	ANNEALED AT 1375F 3HRS AC	PLATE	0.02	10-20			0.25	11.03		
	BA	FORGING	0.02	0.1-20				2.55	105.12	

TABLE 6.0.4.2 (CONTINUED)

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: L-T **STRESS RATIO: -1.0 - 0.8** **FREQUENCY: 0.1 TO 55. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-6Al-4V (Cont'd)	BETA PROCESSED - MA	PLATE	0.1	1				0.87		
			0.5	1			1.84			
	MA	PLATE	-1	10			1.14	12.91	322.86	
			0.02	0.1-20			0.32	10.8		
			0.02	1-27			0.11			
			0.02	5-30		0.02	0.4	15.79		
			0.02	0.1-30			0.15	6.77		
			0.04	20					93.19	
			0.05	20				6.34		
			0.3	20			0.99			
			0.5	10			8.51	97.18		
		FORGING	0.02	1-30				8.18	292.11	
		EXTRUSION	0.1	10			4.64			
			0.1	1-10				9.35	189.23	
			0.1	1-20				12.2	225.55	
			0.3	10		0.39	8.82			
		Unspecified	0.55	10		0.84				

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: L-T **STRESS RATIO: -1.0 - 0.8** **FREQUENCY: 0.1 TO 55. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-6Al-4V ELI	ANNEALED	FORGING	0.1	1-10				13.27	209.7	
	RA	PLATE	-1	8			3.1			
			-1	10				23.32		
			-0.66	8			2.97	22.01		
			-0.66	10				23.96		
			-0.33	8			2.5	21.42		
			-0.33	10				20.27		
			0.	8			1.61	21.49		
			0.	10			1.71	18.61		
			0.1	10				11.54		
			0.55	8	0.01	0.2	5.22			
Ti-6Al-6V-2Sn	MA	EXTRUSION	0.02	0.1-10			0.43	8		
			0.02	20		0.05	0.65			

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: L-T **STRESS RATIO: -1.0 - 0.8** **FREQUENCY: 0.1 TO 55. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-8Al-1Mo-1V	1825F 1HR AC 1350F 2HRS AC	Unspecified	0.	0.33				10.22		
			0.04	0.33			0.51			
	DA	SHEET	0.1	43				7.92	238.6	
			0.25	1-30					160.57	
			0.67	1-30			2.54			
	MA	SHEET	0.1	43				7.3		
	Unspecified	SHEET	0.02	0.1-12			2.28	13.54	144.35	

TABLE 6.0.4.3

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: T-L **STRESS RATIO: 0.02 - 0.8** **FREQUENCY: 0.1 - 58.3 Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-5Al-2.5Sn	ANNEALED	SHEET	0.1	30				11.18	140.04	
			0.1	50				11.76		
			0.67	55-58.3		0.16	3.08			
Ti-6Al-4V	ANNEALED	FORGING	0.1	5				13.11		
			0.1	20			0.65	12.14		
			0.4	10		0.1	2.41	18.6		
			0.4	20		0.05	1.41	17.34		
			0.8	15		0.23				
			0.8	30		0.25	6.32			
		EXTRUSION	0.1	5-10			0.34	7.95		
			0.1	15				5.84	161.87	
			0.1	20		0.01	0.2			
			0.4	5-15		0.06	0.84	14.05		
			0.4	15		0.03	0.4	13.39		
			0.8	30		0.08	0.87			

TABLE 6.0.4.3 (CONCLUDED)

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: T-L **STRESS RATIO: 0.02 - 0.8** **FREQUENCY: 0.1 - 58.3 Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi/in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-6Al-4V (Cont'd)	AS WELDED E.B. WELDMENT (HAZ)	WELDMENT	0.1	10				6.52		
	AS WELDED E.B. WELDMENT (WELD ZONE)	WELDMENT	0.1	10				5.94		
	BA	FORGING	0.02	0.1-20				1.93	94.89	
	MA	EXTRUSION	0.1	5-20				13.75	276.81	
	RA	PLATE	0.1	10				23.53		
	STRESS RELIEVED E.B. WELDMENT (HAZ)	WELDMENT	0.1	10				11.35	508.19	
	STRESS RELIEVED E.B. WELDMENT (WELD ZONE)	WELDMENT	0.1	10				10.93		
Ti-6Al-4V ELI	ANNEALED	FORGING	0.1	1-10				12.21	249.29	
			0.1	5-20				8.34	158.75	
	RA	PLATE	0.1	1-10				7.61	227.75	

TABLE 6.0.4.4

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: R-C **STRESS RATIO: 0.05 - 0.5** **FREQUENCY: 0.1 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-5-2.5 ELI	Unspecified	DISK	0.05	0.1				11.41		
			0.05	10				11.62	142.07	
			0.5	0.1			2.35	16.79		
			0.5	10			2.76	17.77		

TABLE 6.0.4.5

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: C-R **STRESS RATIO: -1.0 - 0.7** **FREQUENCY: 0.1 - 30. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*) ΔK *Level* (*Ksi/in*)					
					2.5	5.0	10.0	20.0	50.0	100.0
IMI-834	1864F 2HRS; OQ TO R.T.; AGE 1161F 2HRS	DISK	0.1	1			0.22	7.72		
Ti-5-2.5 ELI	Unspecified	DISK	0.05	0.1				12.29		
			0.05	10		1.88	19.49	261.66	106.63	
			0.5	0.1			2.79	15.32		
			0.5	10			2.81	24.16		
Ti-6-2-4-2	1790F 1HR AC 1100F 8HR AC	FORGING	0.1	0.16				10		
			0.5	0.16			2.3			
Ti-6-2-4-6	1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC	FORGING	0.1	30		0.1	1.01			
			0.7	0.16	0.06	0.55				
Ti-6Al-4V	1775F 1HR WQ 1675F 1HR WQ 1000F 4HR AC	DISK	0.05	0.33-10					162.45	
	1775F 1HR WQ 1675F 1HR WQ 1000F-1200F 2-8HR AC	DISK	0.03	0.33			0.82	11.45		
			0.03	0.5				9.93		
			0.25	0.33				22.1		
			0.25	0.5				17.73		

TABLE 6.0.4.5 (CONCLUDED)

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: C-R **STRESS RATIO: -1.0 - 0.7** **FREQUENCY: 0.1 - 30. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi/in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-6Al-4V (Cont'd)	Unspecified	Unspecified	-1	0.16			1.14			
			-0.5	0.16			1.21			
			0.1	20				10.35		
			0.3	20			1.66	16.26		
			0.5	20			1.82			
			0.7	20		0.15				
Ti-8Al-1Mo-1V	1830F 1HR WQ 1100F 8HRS AC	FORGING	0.1	30		0.13	1.14			

TABLE 6.0.4.6

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: C-S **STRESS RATIO: 0.05 - 0.5** **FREQUENCY: 0.1 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi/in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-5-2.5 ELI	Unspecified	DISK	0.05	10					101.63	
			0.5	0.1			0.9	7.78		
			0.5	10			0.46	8.85		

TABLE 6.0.4.7

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: S-C **STRESS RATIO: 0.05 - 0.5** **FREQUENCY: 0.1 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-5-2.5 ELI	Unspecified	DISK	0.05	0.1				9.9	200.55	
			0.05	10				10.05	196.41	
			0.5	0.1			1.8	15.77		
			0.5	10			3	18.45		

TABLE 6.0.4.8

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: R-S **STRESS RATIO: 0.05 - 0.5** **FREQUENCY: 0.1 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-5-2.5 ELI	Unspecified	DISK	0.05	0.1			0.44	3.78		
			0.05	10			0.08	3.48	71.92	
			0.5	10			0.93	13.57		

TABLE 6.0.4.9

FATIGUE CRACK GROWTH RATE (FCGR) COMPARISON AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK FOR TITANIUM ALLOYS IN LAB AIR AT ROOM TEMPERATURE

ORIENTATION: S-R **STRESS RATIO: 0.05 - 0.5** **FREQUENCY: 0.1 - 10. Hz**

ALLOY	CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
					2.5	5.0	10.0	20.0	50.0	100.0
Ti-5-2.5 ELI	Unspecified	DISK	0.05	0.1				8.45		
			0.05	10				7.15	194.49	
			0.5	0.1			1.9	14.85		
			0.5	10			1.89	20.85		

TABLE 6.0.5

STRESS CORROSION CRACKING THESHOLD DATA FOR TITANIUM ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Specimen Orientation	K_{Iscc} $Ksi\sqrt{in}$ Environment				
				3.5% NaCl	Sump Tank Water	Shop Cleaning Solvent	JP-4 Jet Fuel	Methanol
BETA	BETA STAB	Sheet	L-S	68				
Ti-4Al-3Mo-1V	MA	Plate	L-S	105				
Ti-6Al-4V	1300F 2HR AC	Extrusion	L-S	65				
			L-T	73				
	1700F 4HR FC TO 1400F AC DB THERMAL CYCLE	Plate	L-T		66			
			T-L		55.2(5)	69		
	1725F 1HR WQ 1000F 1HR AC (STA)	Extrusion	L-S	48.5(2)				
	1725F 1HR WQ 1250F 4HR AC (STOA)	Extrusion	L-S	65(2)				
	1750F 1000F 2HR AC	Forging	L-T	31			43.3	
	ALPHA-BETA FORGED	Forging	T-L	27				
	AS RECEIVED PROBABLY MA	Plate	T-S	105				
	BETA FORGED	Forging	T-L	34				
	FINISH ROLLED 1440F	Plate	T-S	82.6(11)				
	GTA WELD POSTWELD 1100F 2HR (HEAT AFFECTED ZONE)	Plate	L-T		74.3(3)	64		
	GTA WELD POSTWELD 1100F 2HR (WELD ZONE)	Plate	L-T		93			
	GTA WELD POSTWELD 1200F 1HR (HEAT AFFECTED ZONE)	Plate	L-T		66.5(2)			

TABLE 6.0.5 (CONTINUED)

STRESS CORROSION CRACKING THESHOLD DATA FOR TITANIUM ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Specimen Orientation	K_{Iscc} Ksi$\sqrt{in}$ Environment				
				3.5% NaCl	Sump Tank Water	Shop Cleaning Solvent	JP-4 Jet Fuel	Methanol
Ti-6Al-4V (Cont'd)	GTA WELD POSTWELD 1400F 1HR (HEAT AFFECTED ZONE)	Plate	L-T		66(2)			
	MA	Plate	L-S	32				
			T-S	67				
	MINUTEMAN CASING	Plate	T-S	55				
	RA	Plate	L-T		61.7(12)			
			T-L		59.8(6)	69(2)		
		Forging	T-L		53(2)			
			S-L		58.7(6)			
Ti-6Al-4V ELI	1800F 1HR HELIUM COOL	Plate	T-S	84				
Ti-6Al-6V-2.5Sn	1000F 2HR AC	Forging	L-T				30.5	
	1300F 2HR AC	Forging	L-T	32.4				
	1550F 1HR WQ 900F 4HR AC	Plate	T-S	21				
Ti-8Al-1Mo-1V	1520F 1HR WQ	Plate	T-L					13.8
	1675F 1HR AC 1075F 8HR AC 1000F 2HR AC	Plate	T-L	26.4				
	1700F 1HR AC 1200F 2HR WQ	Plate	T-S	28				
	1825F 1HR AC	Plate	T-S	23				
	2000F 0.5HR AC	Plate	T-L	47.3				

TABLE 6.0.5 (CONCLUDED)

STRESS CORROSION CRACKING THESHOLD DATA FOR TITANIUM ALLOYS AT ROOM TEMPERATURE

Alloy	Condition/ Heat Treatment	Product Form	Specimen Orientation	K_{Iscc} $Ksi\sqrt{in}$ Environment				
				3.5% NaCl	Sump Tank Water	Shop Cleaning Solvent	JP-4 Jet Fuel	Methanol
Ti-8Al-1Mo-1V (Cont'd)	MA	Plate	L-S	20				
			T-S	43.4(7)				
	MA 1435F 8HR FC	Sheet	T-S	21.5(2)				
	VAC ANNEALED	Plate	T-L	24.3(3)				22.7(3)

TABLE 6.1.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY BETA

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Reference
1745F WQ	S	R.T.	---	---	.6M KCL -1000MV	SENT	---	---	---	---	100	>55*	---	1970	82651
					.6M KCl -750MV	SENT	---	---	---	---	100	28*	---	1970	82651
					.6M KCl -500MV	SENT	---	---	---	---	100	22*	---	1970	82651
					.6M KCL 0 MV	SENT	---	---	---	---	100	32*	---	1970	82651
					.6M KCL +500MV	SENT	---	---	---	---	100	34*	---	1970	82651
					.6M KCL +1000MV	SENT	---	---	---	---	100	44*	---	1970	82651
1745F WQ +1095F 16HR	S	R.T.	---	---	.6M KCl -500MV	SENT	---	---	---	---	60	26*	---	1970	82651
					.6M KCl -500MV	SENT	---	---	---	---	32	22*	---	1970	82651
1745F WQ +1095F 250HR	S	R.T.	---	---	.6M KCl -500MV	SENT	---	---	---	---	22	16*	---	1970	82651
1745F WQ +1095F 500HR	S	R.T.	---	---	.6M KCl -500MV	SENT	---	---	---	---	8	8*	---	1970	82651
1745F WQ +1095F 1000HR	S	R.T.	---	---	.6M KCl -500MV	SENT	---	---	---	---	8	8*	---	1970	82651
BETA STAB	S	R.T.	L-S	136	3.5% NaCl	CNT	8	0.16	0.16	---	72	<68*	---	1969	77456

* specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

TABLE 6.2.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY BETA-C AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	STA	44.1	1.4	3	43.9	0.6	2	---	---	---

TABLE 6.2.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK BETA C AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Dry Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
STA	SHEET	0.1	6			2.26	12.33		

TABLE 6.2.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK BETA C AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
STA	SHEET	0.1	0.1-1			3.35	20.23		

TABLE 6.2.2.1

TITANIUM BETA C K_{Ic}															
CONDITION	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN			CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic}			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	DESIGN			K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} MEAN	STAN DEV		
STA	Plate	2.50	-65	L-T	---	1.995	1.001	CT	1.107	0.07	31.40	31.1	0.5	1974	88575 (1)
		2.50			---	2.002	1.000	CT	1.076	0.06	30.50			1974	88575 (1)
		2.50			---	1.988	0.998	CT	1.044	0.07	31.30			1974	88575 (1)
STA	Plate	2.50	R.T.	L-T	180.0	1.993	0.999	CT	1.042	0.15	43.80	44.1	1.4	1974	88575
		2.50			180.0	1.994	1.004	CT	1.074	0.14	42.80			1974	88575
		2.50			180.0	1.996	1.000	CT	1.090	0.16	45.60			1974	88575
STA	Plate	2.50	R.T.	T-L	180.0	1.996	1.002	CT	1.047	0.14	43.40	43.9	0.6	1974	88575
		2.50			180.0	1.995	1.001	CT	1.041	0.15	44.30			1974	88575

NOTES: (1) TYS APPROX. 190

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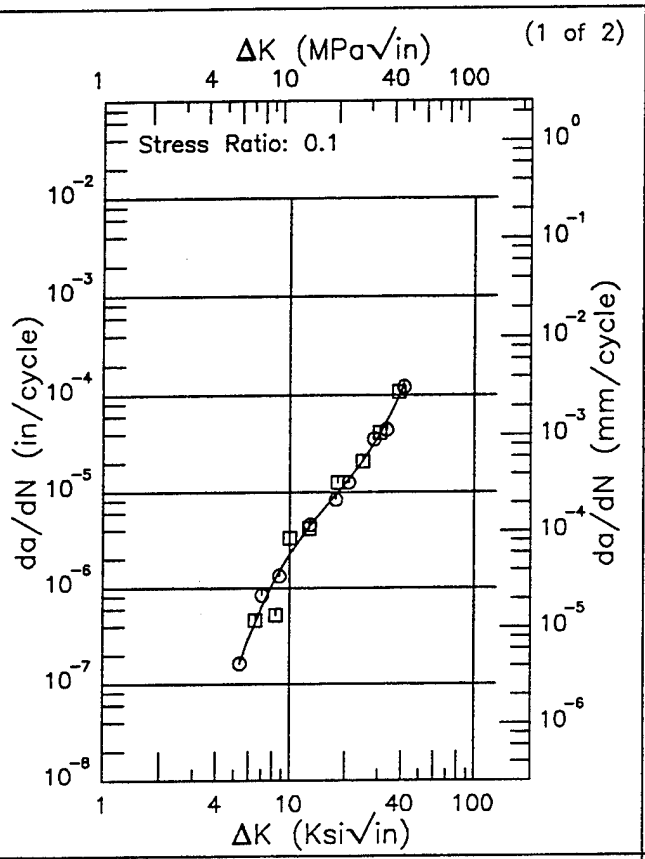
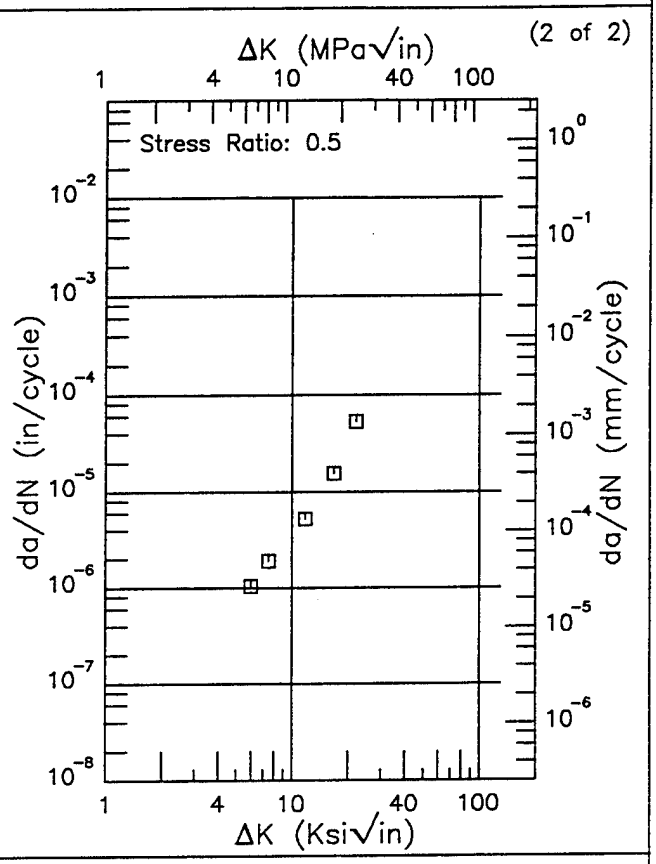
BETA C

R

Condition/Ht: STA
Form: 0.13 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 167.7 ksi
Ult. Strength: 183.5 ksi
Specimen Thk: 0.125 – 0.126 in.
Specimen Width: 6.002 – 6.026 in.
Ref: 88575





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.37 (min)	0.164
6.	0.301
7.	0.624
8.	1.07
9.	1.62
10.	2.26
13.	4.56
16.	7.40
20.	12.3
25.	21.6
30.	37.1
35.	63.5
40.	110.
41.22 (max)	125.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
22.15	0. .5 .8 1.25 2.

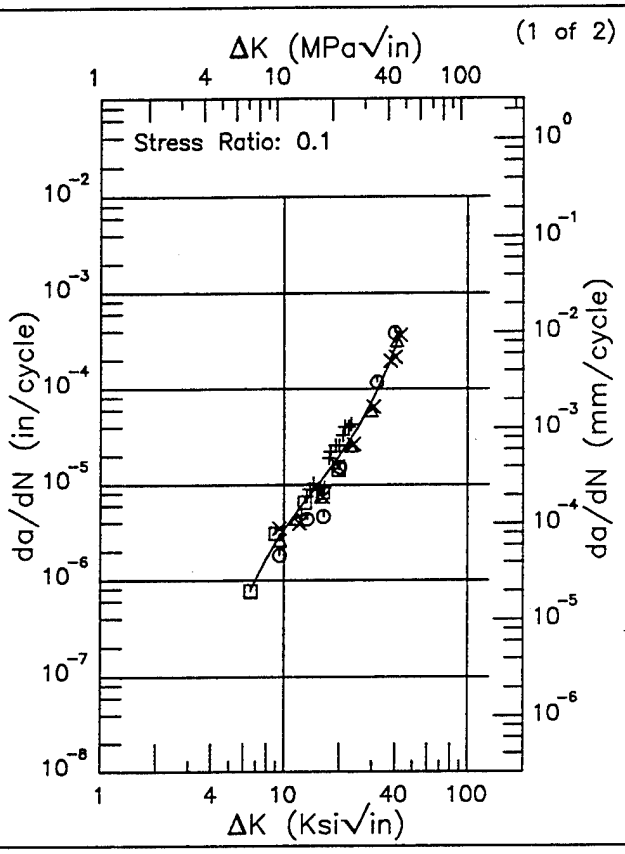
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

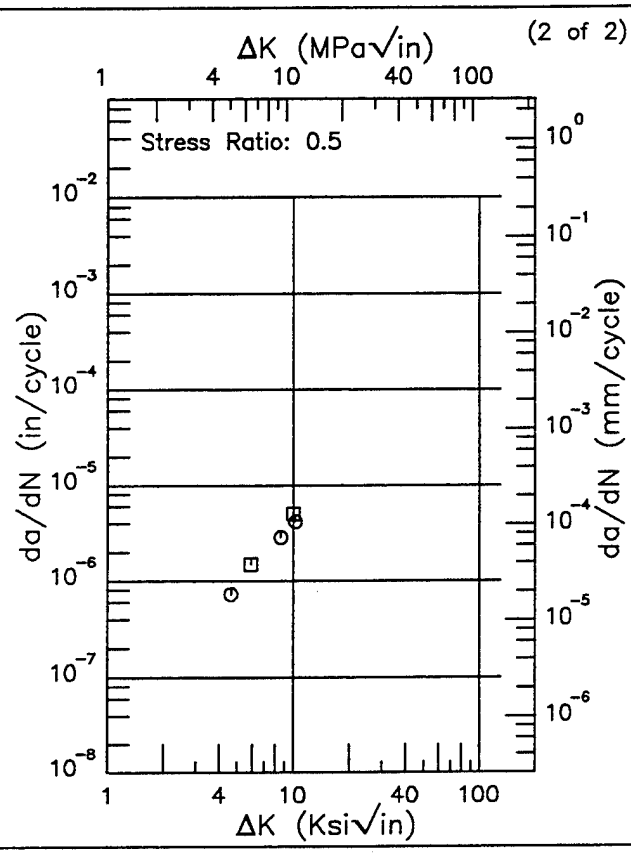
Figure 6.2.3.1.1

BETA C R

Condition/Ht: STA
Form: 0.12 – 0.13 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 0.1 – 1 Hz
Environment: S.T.W.; RT

Yield Strength: 167.7 ksi
Ult. Strength: 183.5 ksi
Specimen Thk: 0.116 – 0.127 in.
Specimen Width: 6.002 – 6.023 in.
Ref: 88575





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.58 (min)	0.805
7.	1.03
8.	1.67
9.	2.45
10.	3.35
13.	6.72
16.	11.3
20.	20.2
25.	39.4
30.	75.1
35.	143.
40.	271.
42.90 (max)	394.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
29.82	⊙ + ⊿ ⊡ 0. .5 .8 1.25 2.

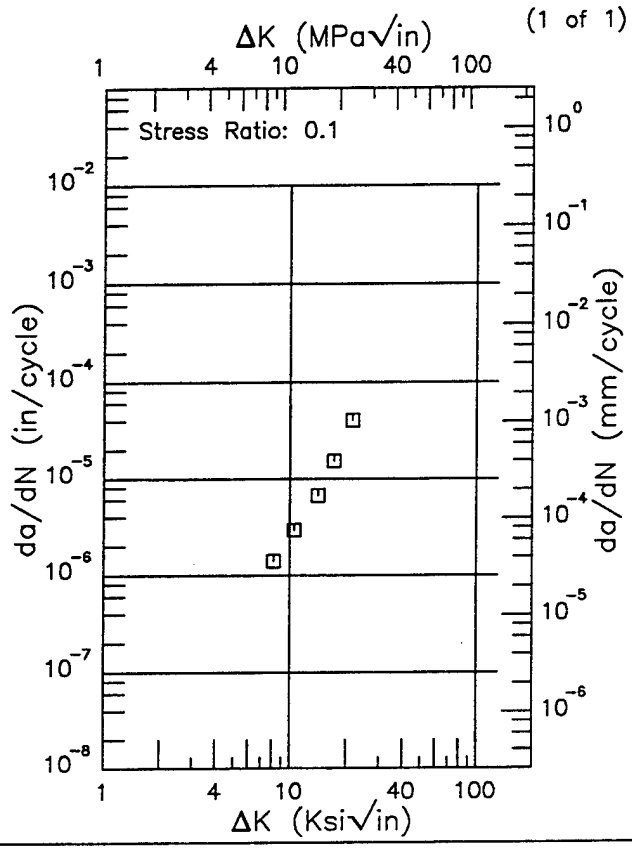
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

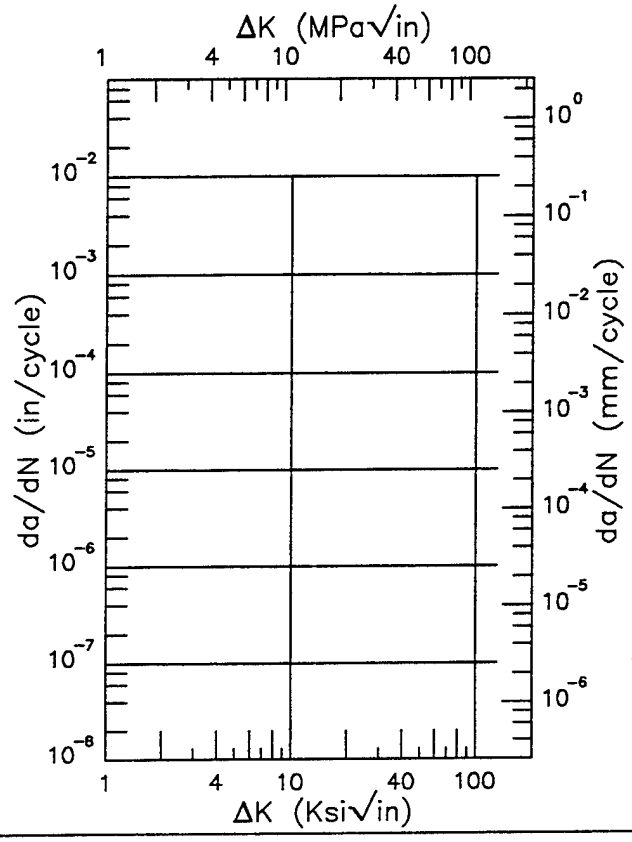
Figure 6.2.3.1.2

R BETA C

Condition/Ht: STA
Form: 0.13 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 167.7 ksi
Ult. Strength: 183.5 ksi
Specimen Thk: 0.127 in.
Specimen Width: 6.009 in.
Ref: 88575





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

Figure 6.2.3.1.3

TABLE 6.3.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY BETA-III AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	1325F .25HR WQ 925F 8HR	49.8	1.2	3	---	---	---	---	---	---

TABLE 6.3.2.1

TITANIUM BETA III K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1325F .25HR WQ 925F 8HR	Plate	0.80	R.T.	L-T	186.0	1.503	0.750	CT	0.795	0.18	50.50	49.8	1.2	1974	91793
		0.80			186.0	1.502	0.750	CT	0.775	0.18	50.40			1974	91793
		0.80			186.0	1.504	0.750	CT	0.763	0.17	48.40			1974	91793
1350F 0.5 HR WQ 950F 8HR AC	Extrusion	3.00	R.T.	C-R	178.0	1.499	0.750	CT	0.773	0.24	55.20	55.1	1.8	1973	87230 (1)
		3.00			178.0	1.499	0.751	CT	0.790	0.23	53.20			1973	87230 (1)
		3.00			178.0	1.499	0.750	CT	0.789	0.26	56.80			1973	87230 (1)
STA-1325F WQ 1045F 8 HR	Plate	1.00	R.T.	T-L	150.0	2.000	1.005	CT	0.977	0.67	85.70	---	---	1973	88144
STA-1325F WQ 1045F 8HR (ELECTRON BEAM WELD ZONE)	Plate	1.00	R.T.	T-L	150.0	2.000	0.991	CT	0.917	0.17	42.20	---	---	1973	88144
STA-1325F WQ 1045F 8HR (HEAT AFFECTED ZONE)	Plate	1.00	R.T.	T-L	150.0	2.000	0.996	CT	0.930	0.55	76.30	---	---	1973	88144

NOTES: (1) ALPHA PRECIPITATE IN BETA MATRIX
STRAIGHTNESS OF CRACK FRONT MAY NOT MEET ASTM E399-72 REQUIREMENTS

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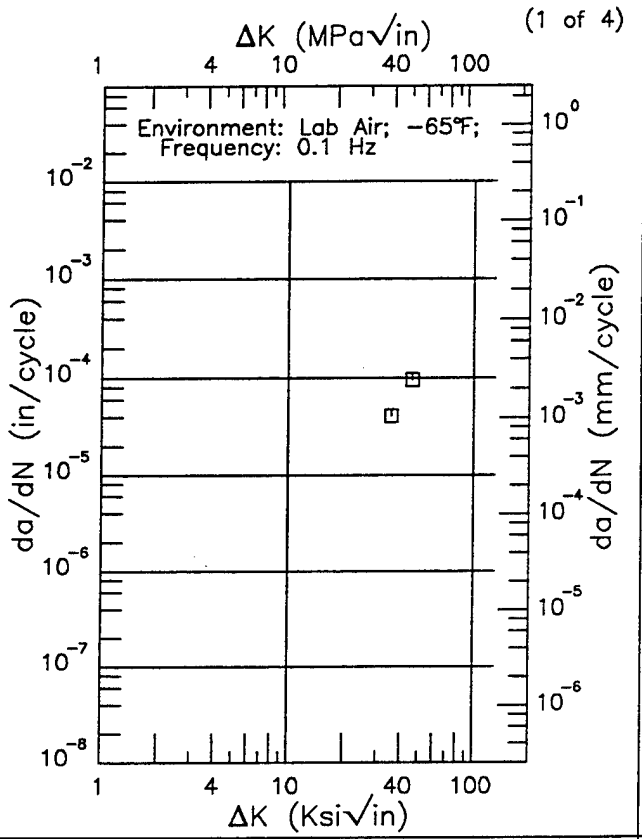
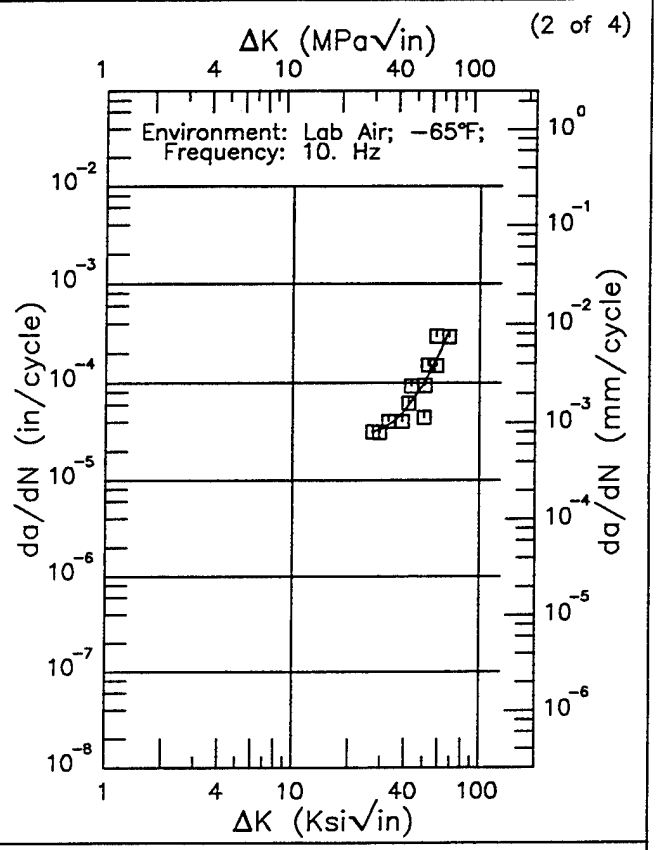
BETA III

EF

Condition/Ht: STA
Form: 1 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.74 (min)	31.6
30.	33.4
35.	40.3
40.	52.2
50.	97.2
60.	190.
68.42 (max)	333.

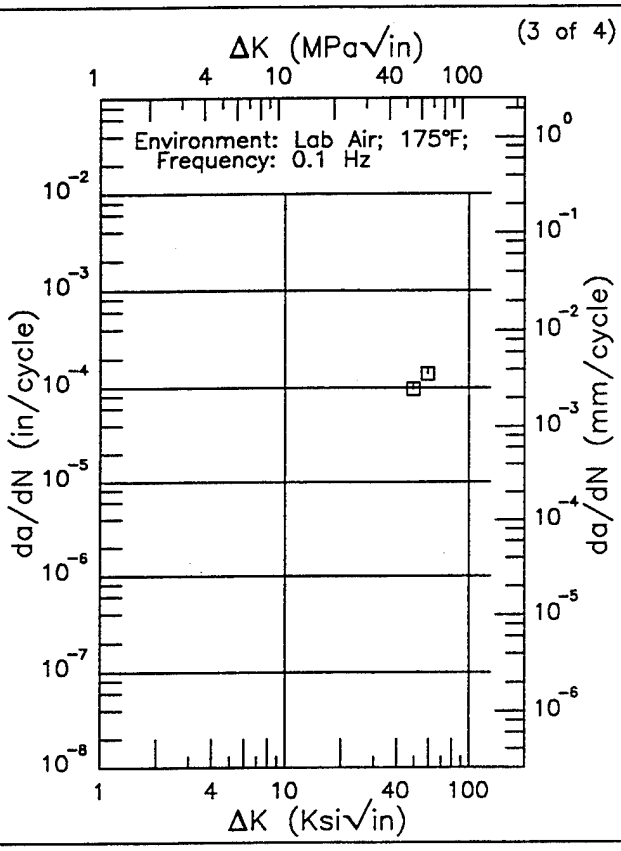
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.	31.39	0. .5 .8 1.25 2.

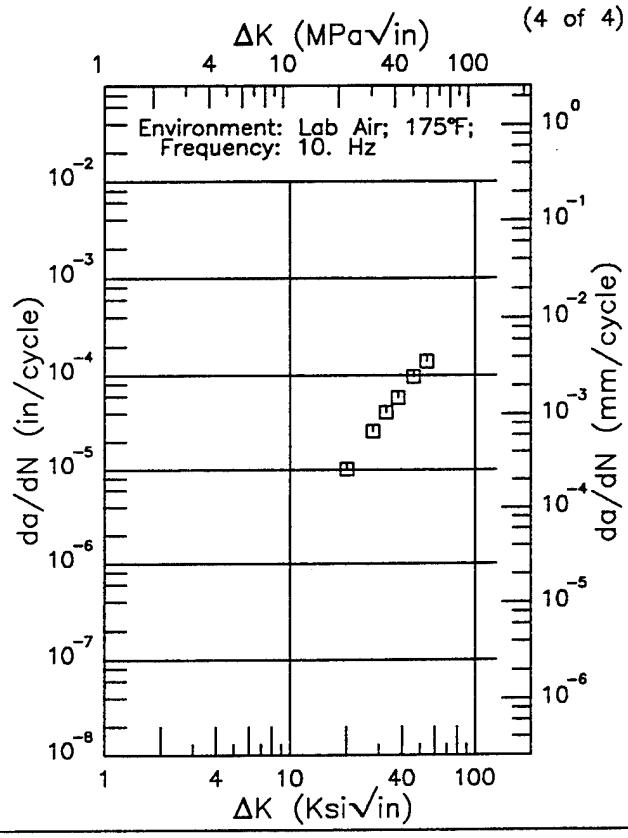
Figure 6.3.3.1.1

BETA III EF

Condition/Ht: STA
Form: 1 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

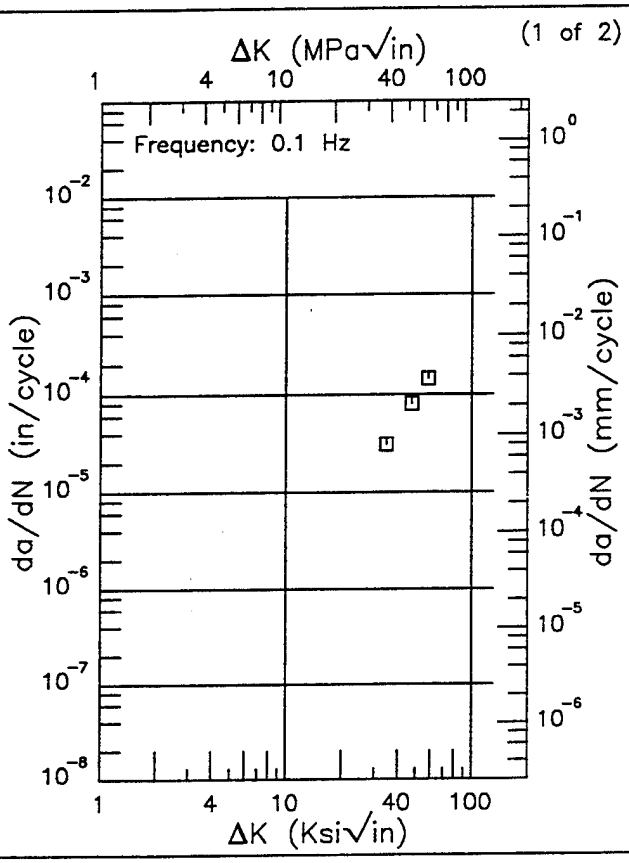
Figure 6.3.3.1.1 (Concluded)

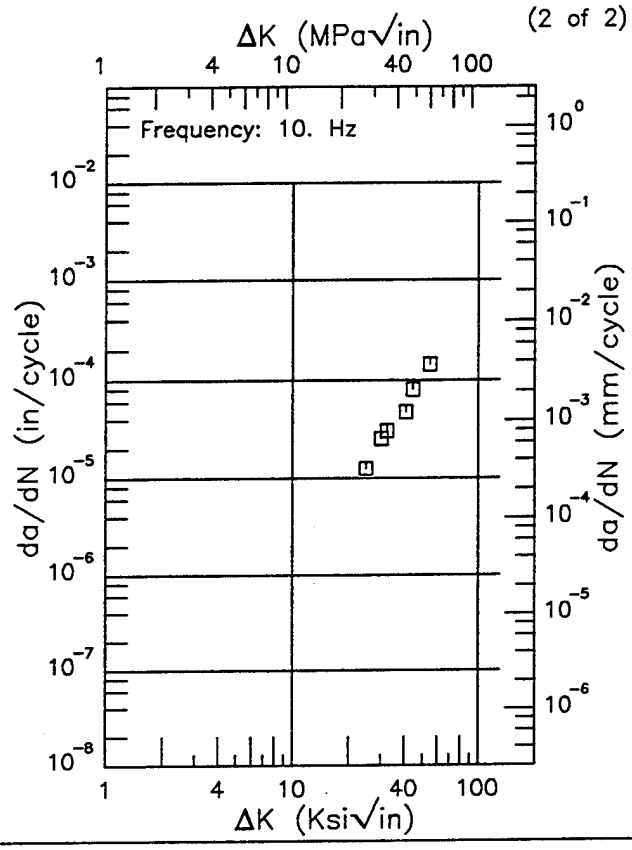
BETA III

F

Condition/Ht: STA E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR;175°F

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

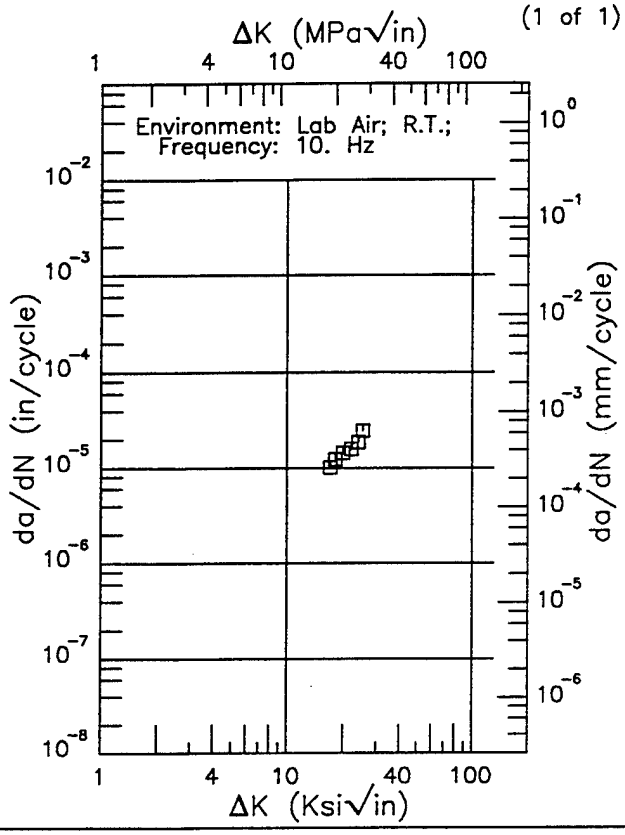
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

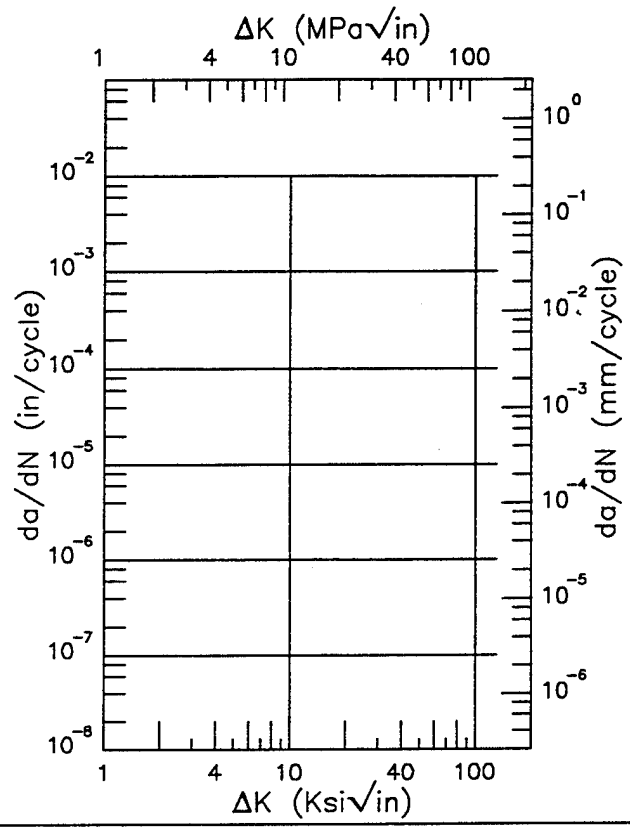
Figure 6.3.3.1.2

BETA III EF

Condition/Ht: STA E.B. WELDMENT (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

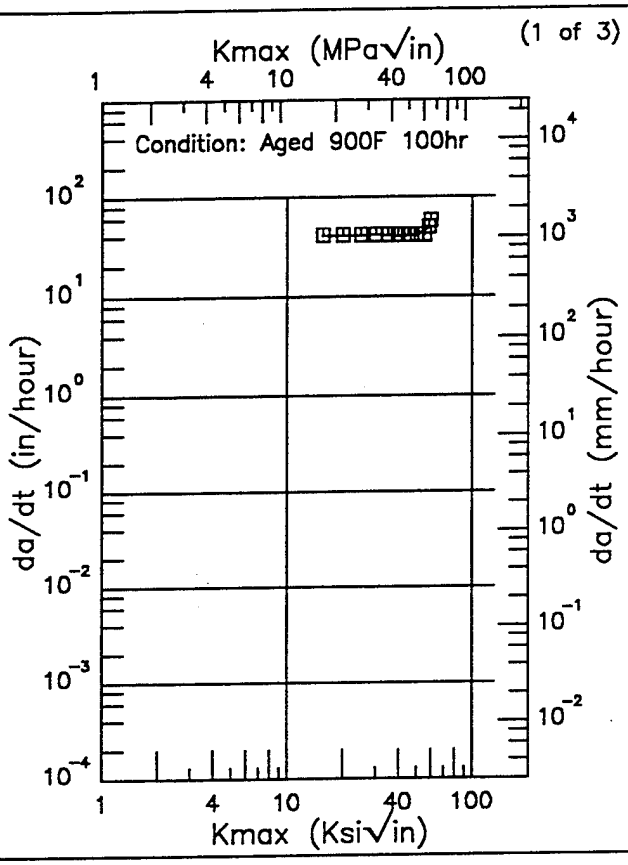
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

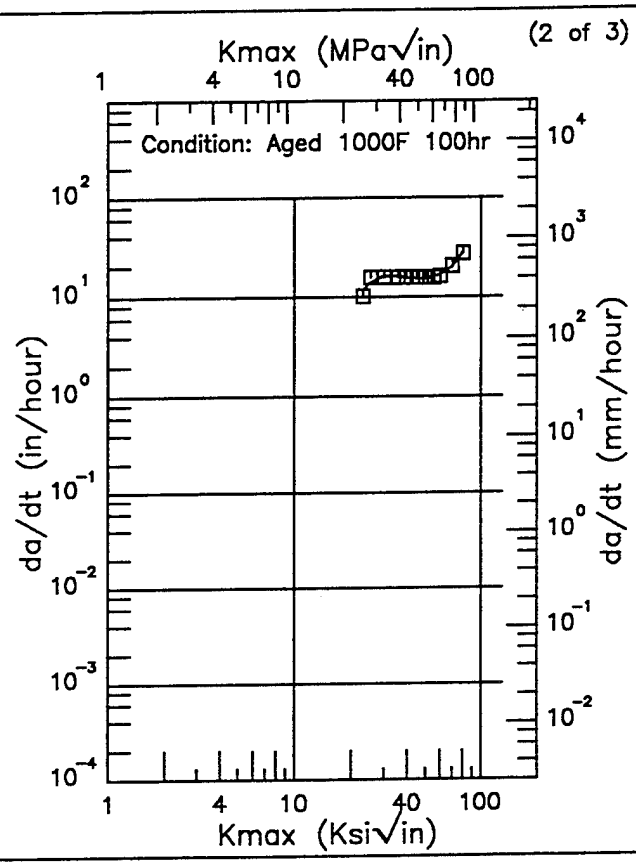
Figure 6.3.3.1.3

BETA III

Condition/Ht:
Environment: 0.6M KCl; 75°F
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
15.50 (min)	40679.
16.	40511.
20.	40187.
25.	40656.
30.	40950.
35.	40700.
40.	39904.
50.	40560.
59.50 (max)	49207.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
23.00 (min)	11248.
25.	13585.
30.	16206.
35.	16046.
40.	15283.
50.	15101.
60.	16587.
70.	19711.
80.00 (max)	27111.

RMS % Error
5.76

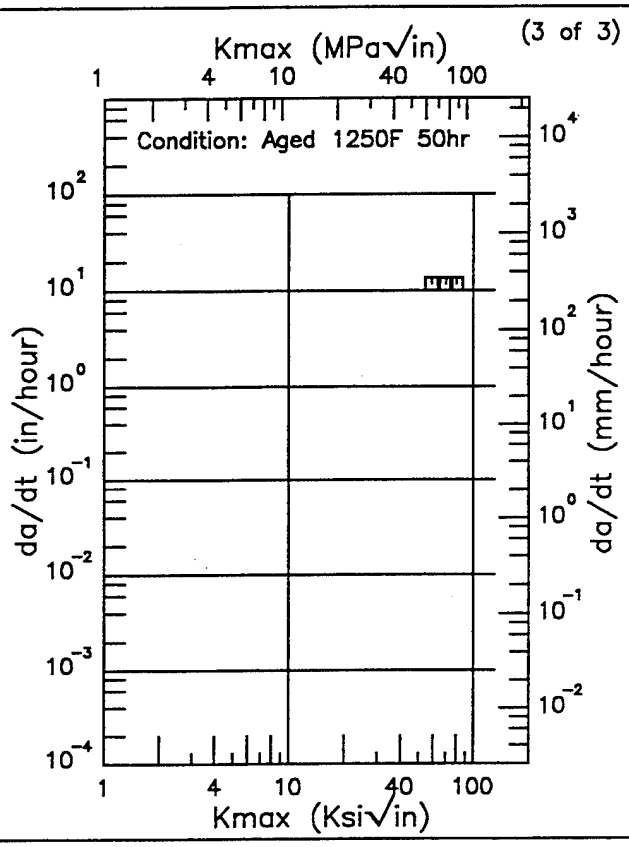
RMS % Error
5.46

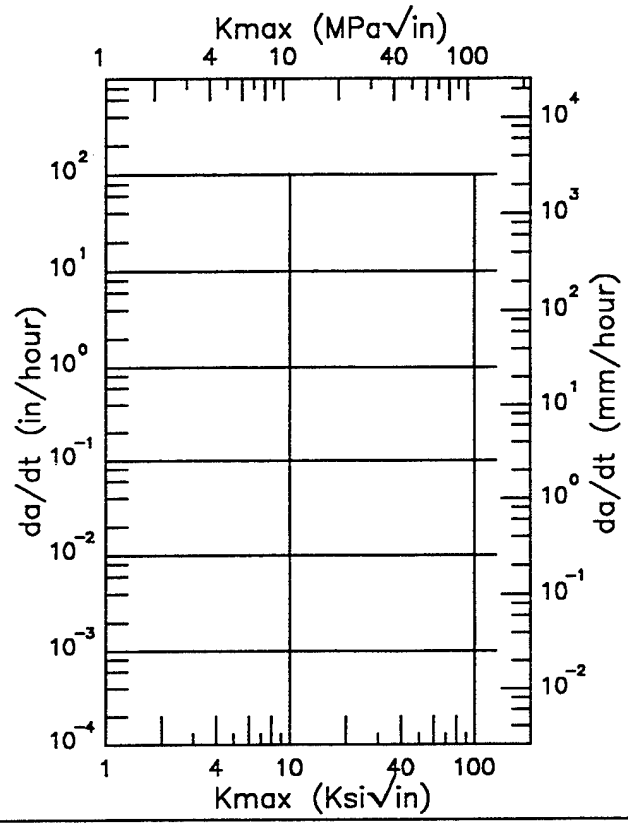
Figure 6.3.3.2.1

BETA III

Condition/Ht:
Environment: 0.6M KCl; 75°F
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in) da/dt (10^{-3}in/hour)

Kmax (Ksi√in) da/dt (10^{-3}in/hour)

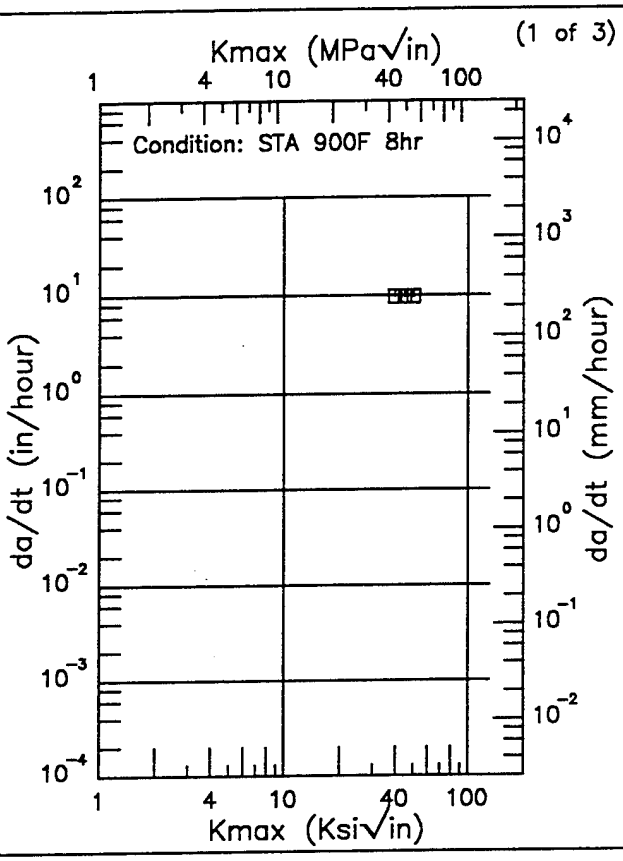
RMS % Error		RMS % Error	

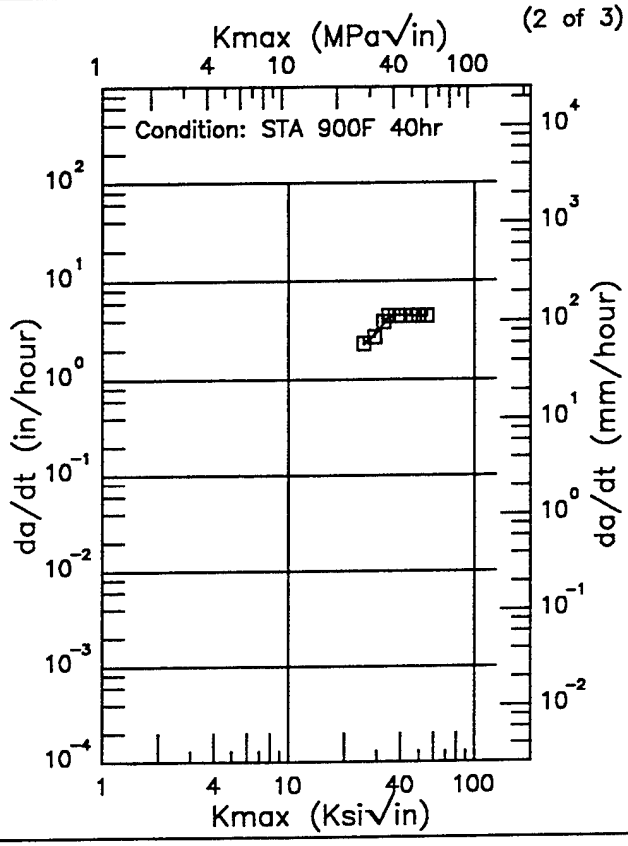
Figure 6.3.3.2.1 (Concluded)

BETA III

Condition/Ht:
Environment: 0.6M KCl
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
25.50 (min)	2289.
30.	2995.
35.	4400.
40.	4516.
50.	4466.
55.00 (max)	4381.

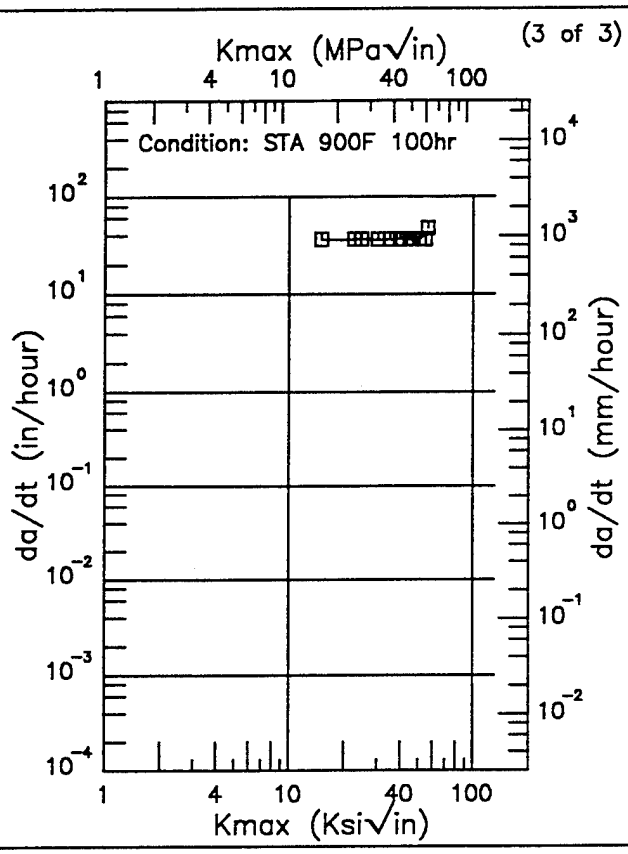
RMS % Error		RMS % Error 2.79	

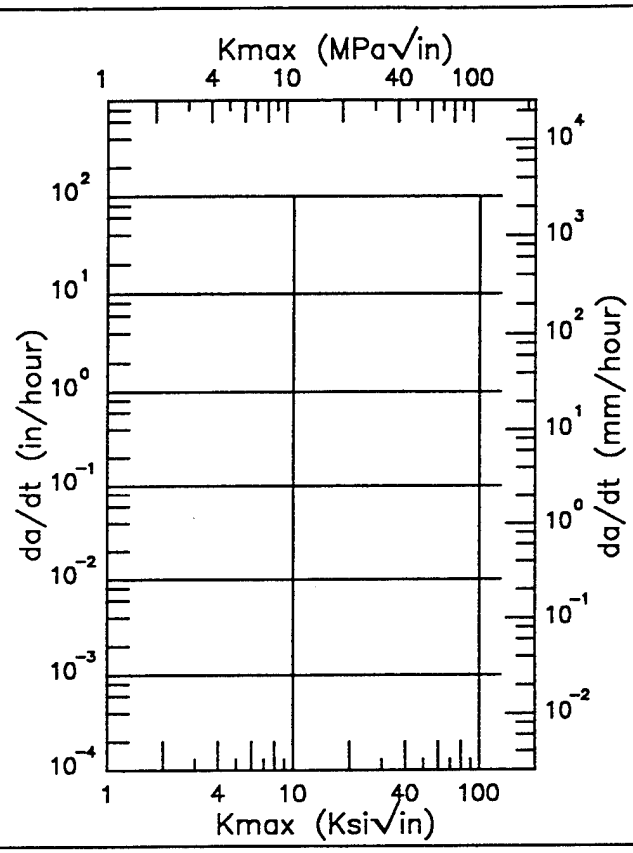
Figure 6.3.3.2.2

BETA III

Condition/Ht:
Environment: 0.6M KCl
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
15.00 (min)	36001.
16.	35573.
20.	35572.
25.	36169.
30.	35929.
35.	35863.
40.	36332.
50.	35079.
56.00 (max)	42764.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
4.61	

RMS % Error	

Figure 6.3.3.2.2 (Concluded)

TABLE 6.3.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY BETA III

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Reference
						Design	Width (in)	Thick (in)							
Beta Stab +Aged 900F 1HR	S	R.T.	---	---	.6M KCl -1500MV	SENT	---	---	---	---	65	55+	---	1970	82651
					.6M KCl -1000MV	SENT	---	---	---	---	65	28+	---	1970	82651
					.6M KCl -750MV	SENT	---	---	---	---	65	16+	---	1970	82651
					.6M KCl -500MV	SENT	---	---	---	---	65	14+	---	1970	82651
					.6M KCl 0 MV	SENT	---	---	---	---	65	21+	---	1970	82651
					.6M KCl +500MV	SENT	---	---	---	---	65	24+	---	1970	82651
					.6M KCl +1000MV	SENT	---	---	---	---	65	25+	---	1970	82651

+ specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

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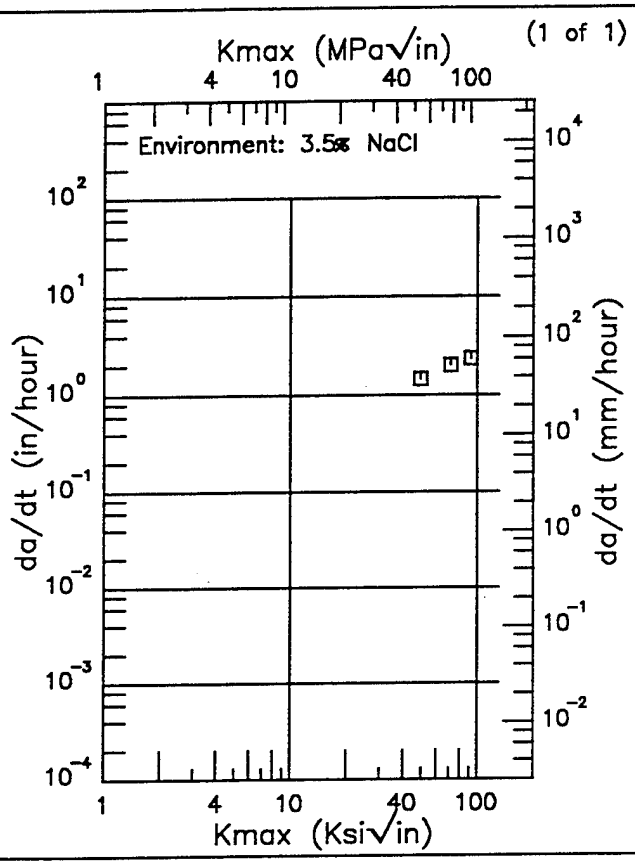
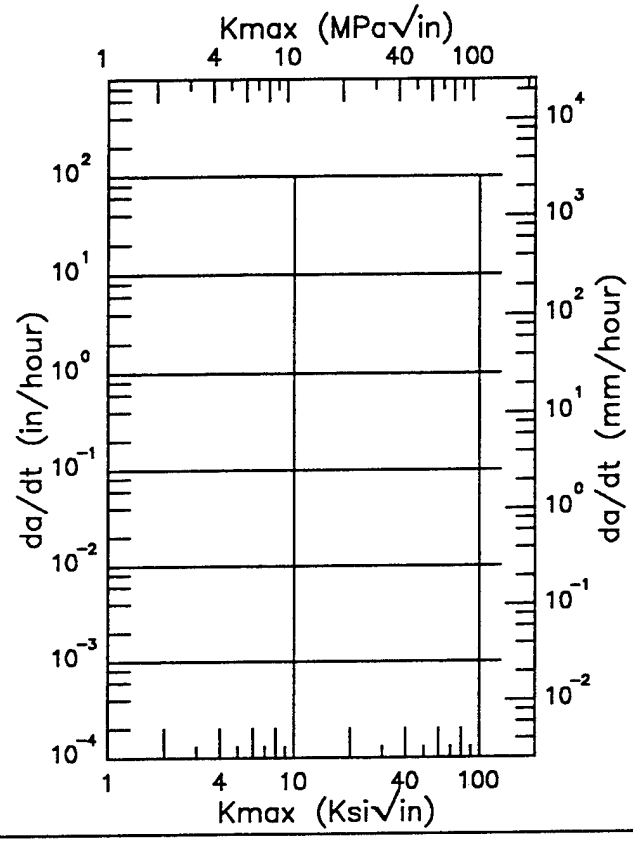
BETA Ti

Condition/Ht: BETA STABILIZED
Form: 0.16 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Yield Strength: 136 ksi
Ult. Strength:

Specimen Thk: 0.16 in.
Specimen Width: 8 in.
A_o:
K_{Iscc}: 68 ksi
Ref: 77456





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)	Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error		RMS % Error	

Figure 6.4.3.2

TABLE 6.5.2.1

TITANIUM CORONA 5 K_{Ic}																
CONDITION	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN			CRACK LENGTH (in.) A	2.5 • $(K_{Ic}/TYS)^2$ (in.)	K_{Ic}			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	DESIGN			K_{Ic} (Ksi • $\sqrt{in.}$)	K_{Ic} MEAN	STAN DEV		
ALPHA-BETA FORGED & LOW ANNEAL & AGE	Forging	2.00	R.T.	---	136.3	---	2.000	---	---	0.57	64.84	---	---	---	RI005

TABLE 6.6.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK IMI-834 AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
1864F 2HRS; OQ TO R.T.; AGE 1161F 2HRS	DISK	0.1	1			0.22	7.72		

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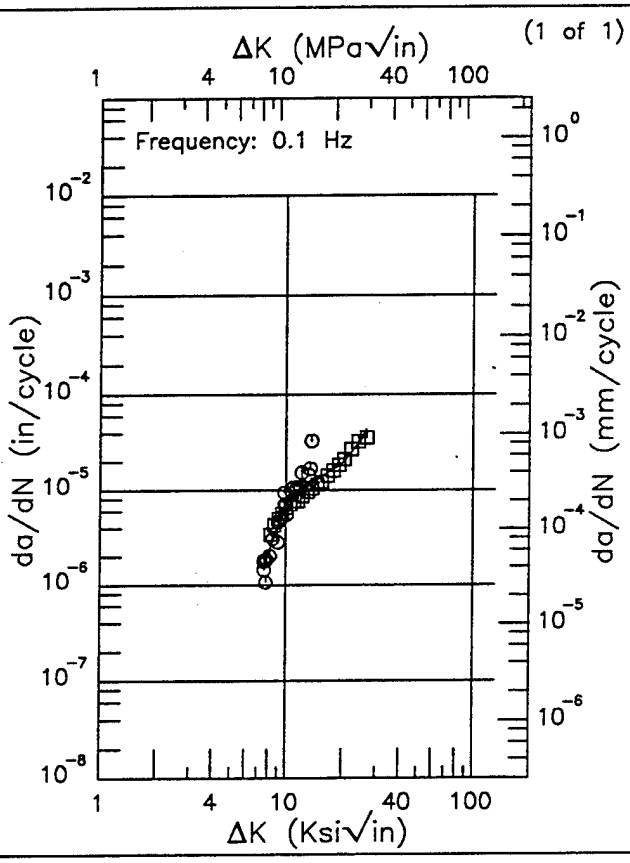
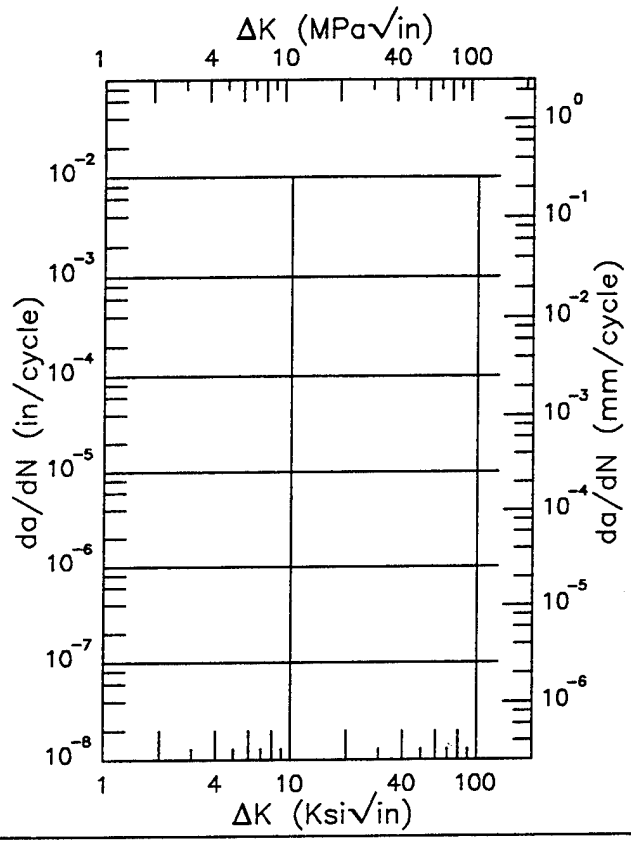
IMI-834

F

Condition/Ht: 1864F 2HRS; OQ TO R.T.; AGE 1161F 2HRS
Form: Disk
Specimen Type: CT
Orientation: C-R
Stress Ratio: 0.1
Environment: LAB AIR;1099°F

Yield Strength: 100 ksi
Ult. Strength:
Specimen Thk: 0.198 in.
Specimen Width: 0.799 in.
Ref: WL010





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.62 (min)	1.54
8.	2.15
9.	4.14
10.	6.34
13.	11.6
16.	14.6
20.	19.3
25.	33.7
26.68 (max)	43.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 34.92

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.6.3.1.1

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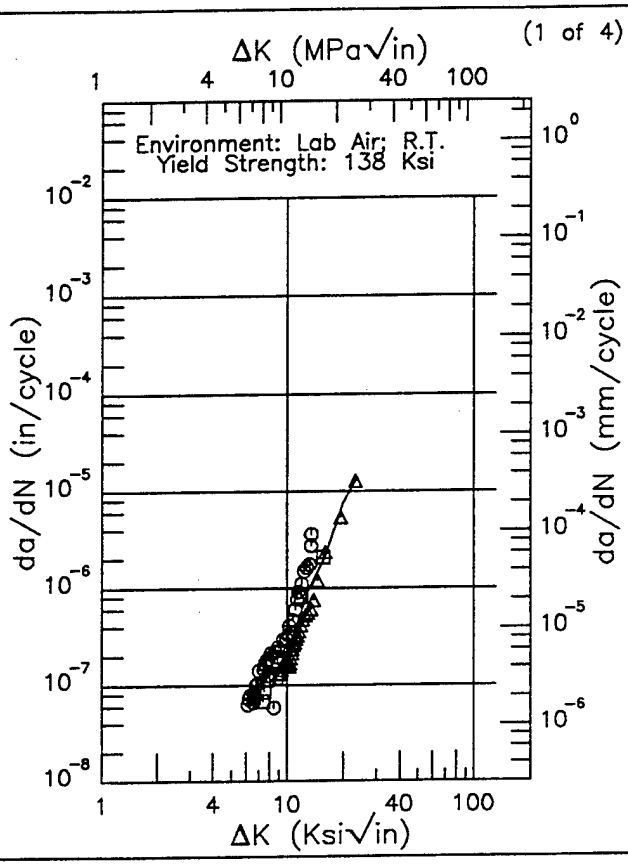
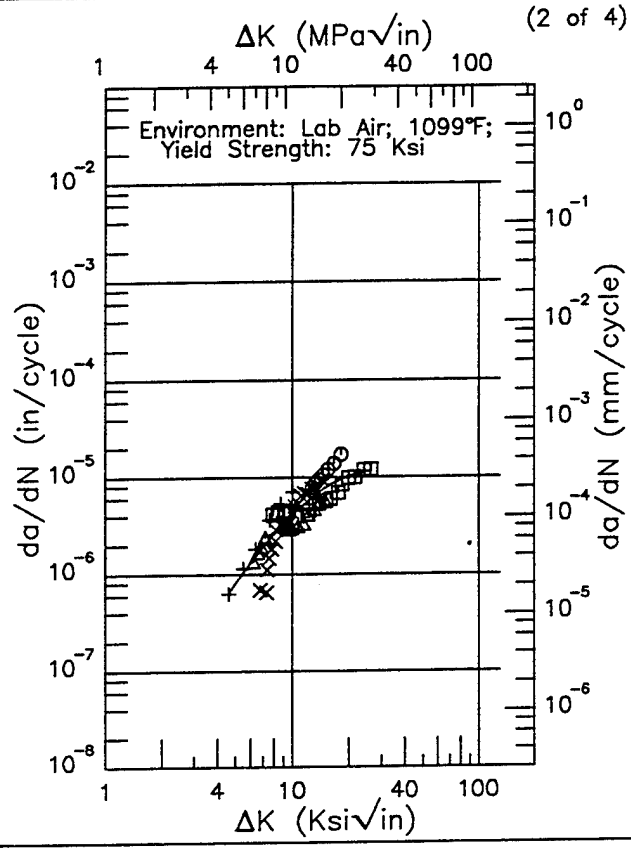
IMI-834

E

Condition/Ht: 1864F 2HRS; OQ TO R.T.; AGE 1161F 2HRS
Form: Disk
Specimen Type: CT
Orientation: C-R
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength: 75 – 138 ksi
Ult. Strength:
Specimen Thk: 0.171 – 0.196 in.
Specimen Width: 0.796 – 0.8 in.
Ref: WL010





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.11 (min)	0.0669
7.	0.101
8.	0.127
9.	0.158
10.	0.216
13.	0.944
16.	2.15
20.	7.72
23.04 (max)	12.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.60 (min)	0.640
5.	0.808
6.	1.31
7.	1.91
8.	2.60
9.	3.33
10.	4.10
13.	6.39
16.	8.38
20.	10.3
25.	11.4
26.25 (max)	11.5

RMS % Error	Life Prediction Ratio Summary
50.54	□ 0. .5 .8 1.25 2.

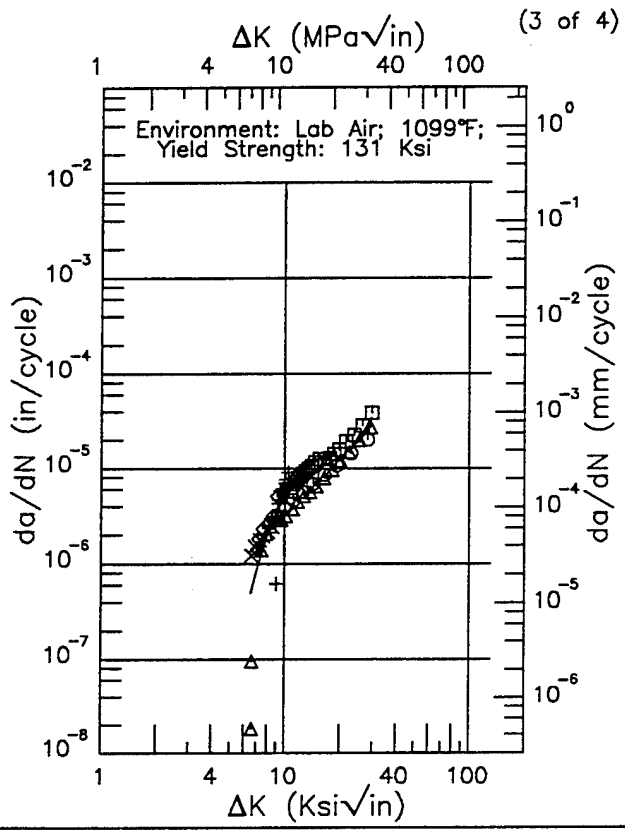
RMS % Error	Life Prediction Ratio Summary
32.51	△ □ ○ 0. .5 .8 1.25 2.

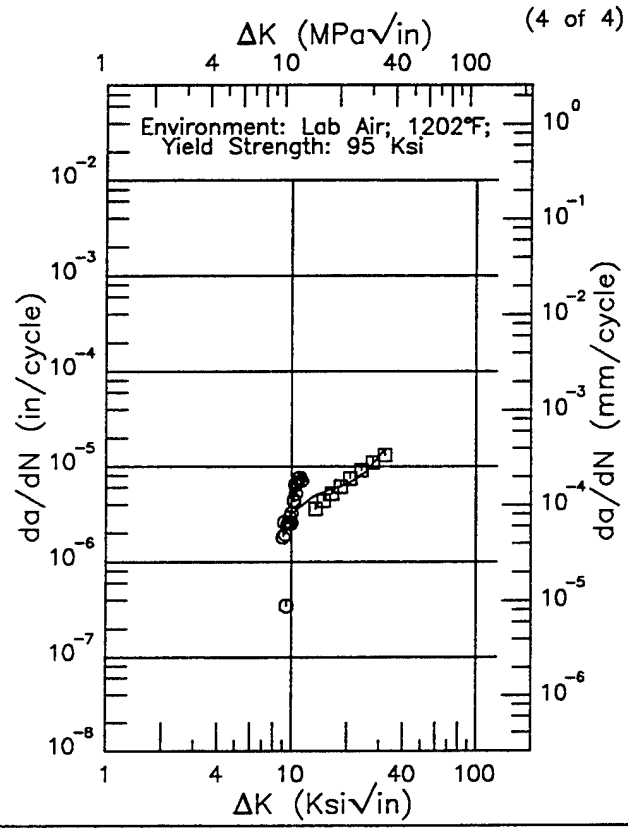
Figure 6.6.3.1.2

IMI-834 E

Condition/Ht: 1864F 2HRS; OQ TO R.T.; AGE 1161F 2HRS
Form: Disk
Specimen Type: CT
Orientation: C-R
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength: 75 – 138 ksi
Ult. Strength:
Specimen Thk: 0.171 – 0.196 in.
Specimen Width: 0.796 – 0.8 in.
Ref: WL010





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.56 (min)	0.500
7.	0.839
8.	1.97
9.	3.44
10.	4.99
13.	8.54
16.	10.5
20.	13.0
25.	19.5
29.62 (max)	34.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.97 (min)	2.34
9.	2.36
10.	3.15
13.	4.80
16.	5.64
20.	6.54
25.	8.52
30.	12.8
31.92 (max)	15.5

RMS % Error	Life Prediction Ratio Summary
38.87	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
49.26	0. .5 .8 1.25 2.

Figure 6.6.3.1.2 (Concluded)

TABLE 6.7.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY TI-* AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	1740F 1 HR AC	61.6	1.6	3	---	---	---	---	---	---
	STA-1740F 1 HR AC 1000F 8HR AC	55.3	1.5	3	---	---	---	---	---	---

TABLE 6.8.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-10-2-3 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

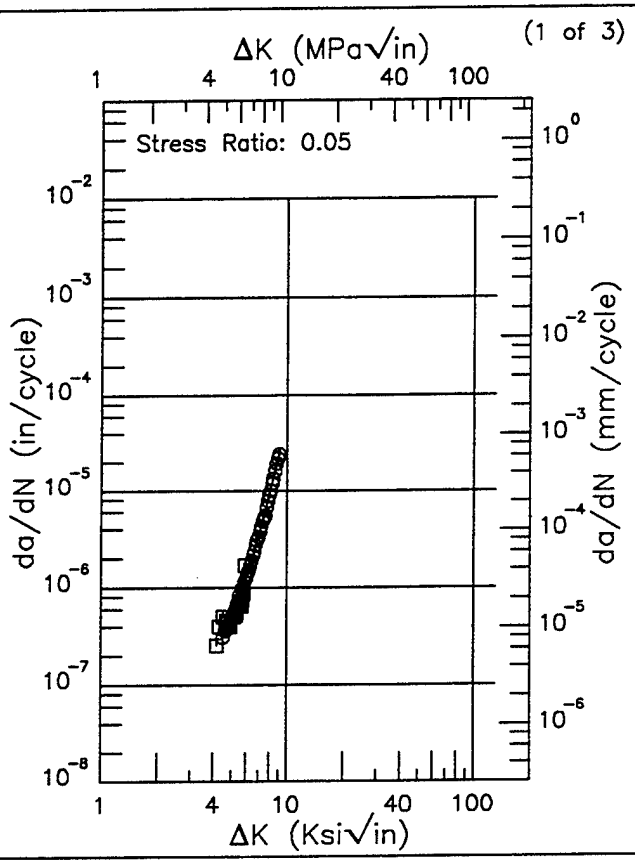
CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	UNSPECIFIED	0.05	10		0.48				
		0.1	10			1.16			
		0.33	10		0.65				

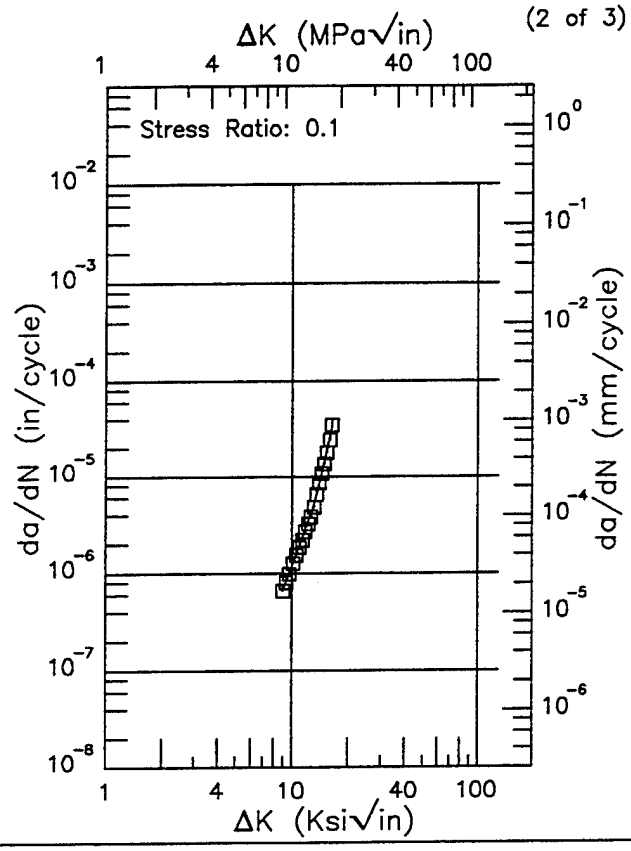
R

Ti–10–2–3

Condition/Ht:
Form:
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.244 – 0.25 in.
Specimen Width: 1.991 – 2.006 in.
Ref: NC005



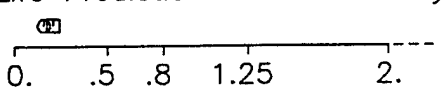


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.17 (min)	0.333
5.	0.483
6.	1.18
7.	3.31
8.	9.16
9.	23.3
9.03 (max)	24.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.93 (min)	0.664
9.	0.689
10.	1.16
13.	4.68
16.	25.4
16.40 (max)	34.3

RMS % Error 12.75

Life Prediction Ratio Summary



RMS % Error 3.46

Life Prediction Ratio Summary

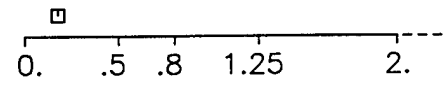
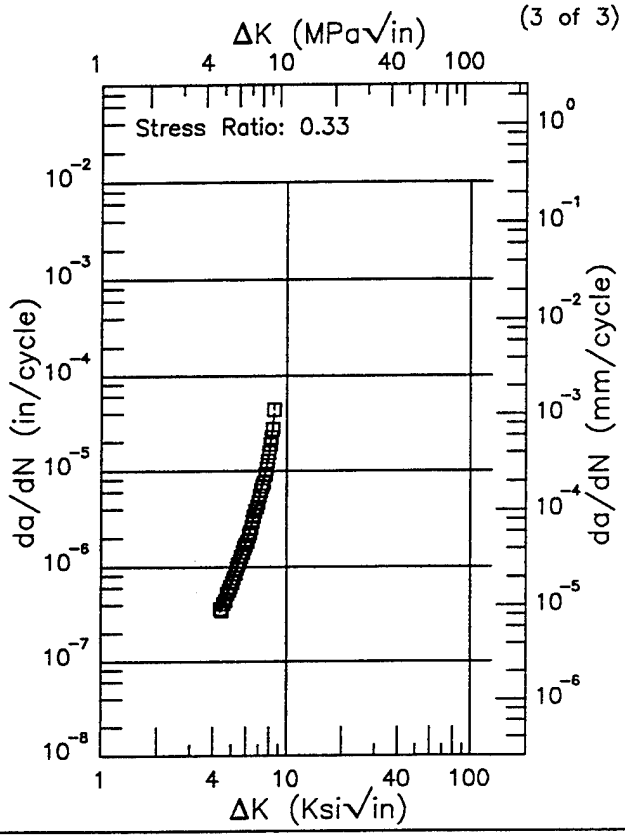


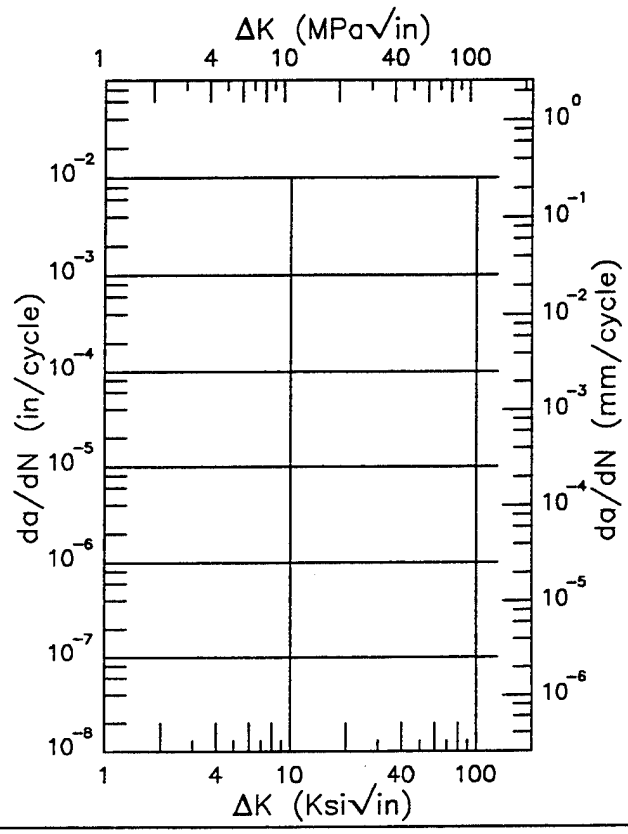
Figure 6.8.3.1

Ti–10–2–3 R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.244 – 0.25 in.
Specimen Width: 1.991 – 2.006 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.36 (min)	0.331
5.	0.652
6.	1.75
7.	4.85
8.	15.3
8.53 (max)	40.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
4.46	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.8.3.1 (Concluded)

TABLE 6.9.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-4Al-3Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Reference
						Design	Width (in)	Thick (in)							
Mill Annealed	P	R.T.	L-S	---	3.5% NaCl	---	---	---	0.5	---	117	105+	---	1969	75386

+ specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

TABLE 6.10.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5-2.5 ELI AT ROOM TEMPERATURE

ORIENTATION: R-C **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	DISK	0.05	0.1				11.41		
		0.05	10				11.62	142.07	
		0.5	0.1			2.35	16.79		
		0.5	10			2.76	17.77		

TABLE 6.10.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5-2.5 ELI AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	DISK	0.05	0.1				12.29		
		0.05	10		1.88	19.49	261.66	106.63	
		0.5	0.1			2.79	15.32		
		0.5	10			2.81	24.16		

TABLE 6.10.1.2.3

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5-2.5 ELI AT ROOM TEMPERATURE

ORIENTATION: CS **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	DISK	0.05	10					101.63	
		0.5	0.1			0.9	7.78		
		0.5	10			0.46	8.85		

TABLE 6.10.1.2.4

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5-2.5 ELI AT ROOM TEMPERATURE

ORIENTATION: SC **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	DISK	0.05	0.1				9.9	200.55	
		0.05	10				10.05	196.41	
		0.5	0.1			1.8	15.77		
		0.5	10			3	18.45		

TABLE 6.10.1.2.5

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5-2.5 ELI AT ROOM TEMPERATURE

ORIENTATION: RS **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	DISK	0.05	0.1			0.44	3.78		
		0.05	10			0.08	3.48	71.92	
		0.5	10			0.93	13.57		

TABLE 6.10.1.2.6

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5-2.5 ELI AT ROOM TEMPERATURE

ORIENTATION: SR **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	DISK	0.05	0.1				8.45		
		0.05	10				7.15	194.49	
		0.5	0.1			1.9	14.85		
		0.5	10			1.89	20.85		

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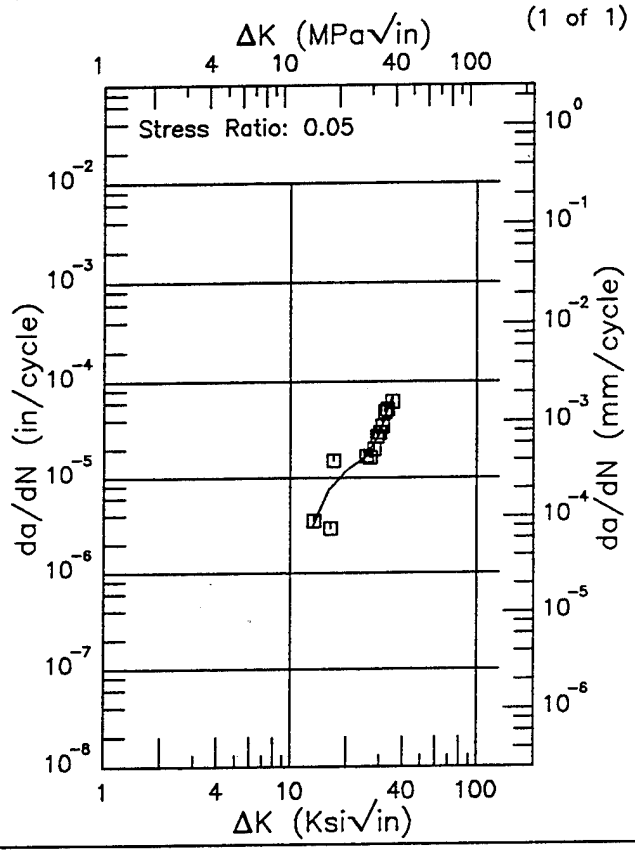
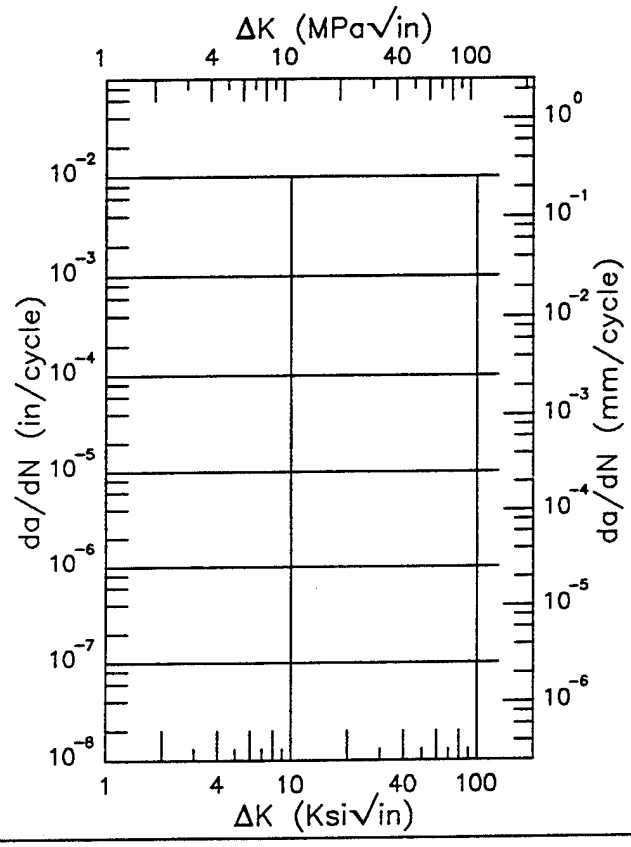
R

Ti-5-2.5 ELI

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R-C
Frequency: 0.1 Hz
Environment: LIQUID HYDROGEN;-423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.744 in.
Specimen Width: 2.002 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.30 (min)	3.15
16.	7.47
20.	11.8
25.	16.4
30.	28.3
35.	69.1
35.20 (max)	72.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
30.70	0. .5 .8 1.25 2.

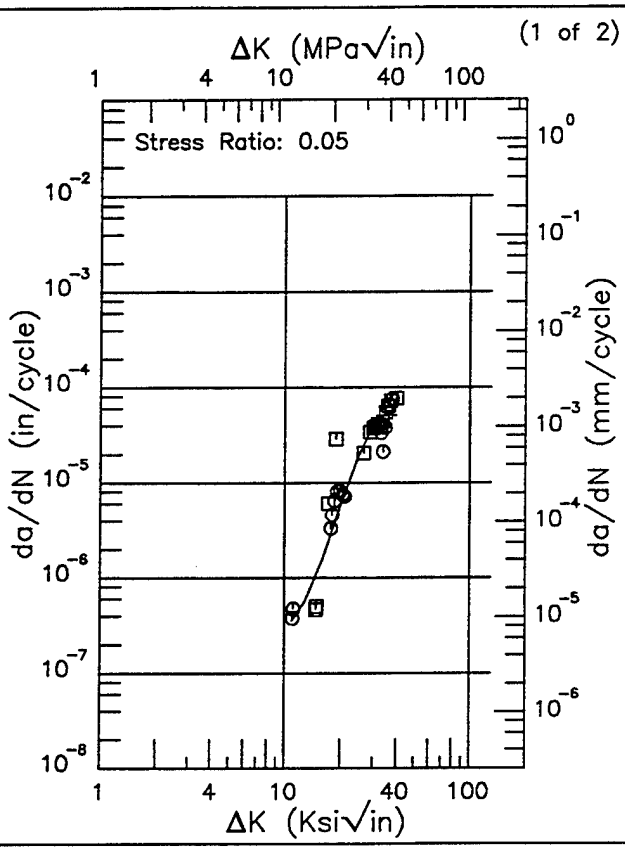
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

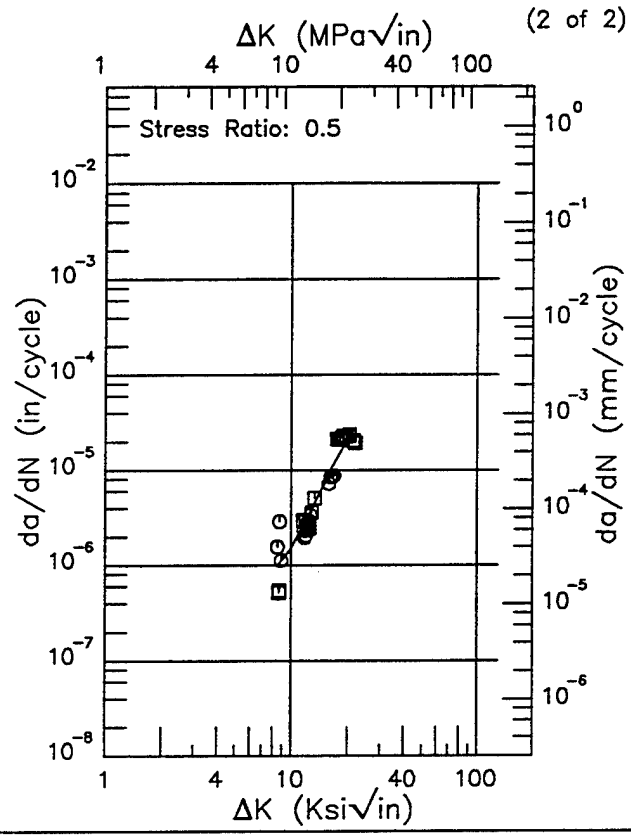
Figure 6.10.3.1.1

Ti–5–2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R–C
Frequency: 10 Hz
Environment: LIQUID HYDROGEN;–423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.745 – 0.748 in.
Specimen Width: 2.003 – 2.011 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.98 (min)	0.356
13.	0.579
16.	1.57
20.	5.72
25.	19.4
30.	40.3
35.	54.0
39.97 (max)	50.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.44 (min)	0.990
9.	1.13
10.	1.51
13.	4.01
16.	9.48
20.	21.3
21.84 (max)	27.1

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
41.66	0. .5 .8 1.25 2.

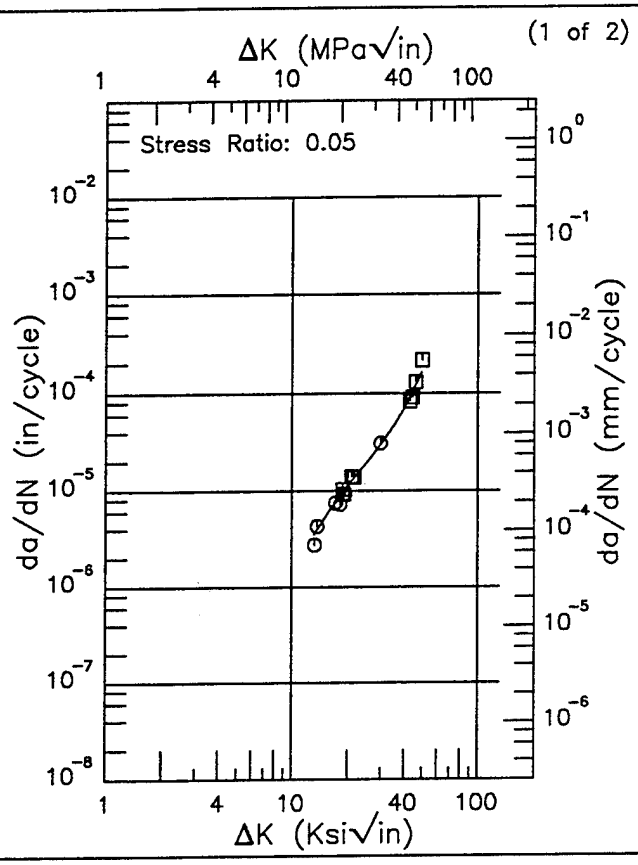
Figure 6.10.3.1.2

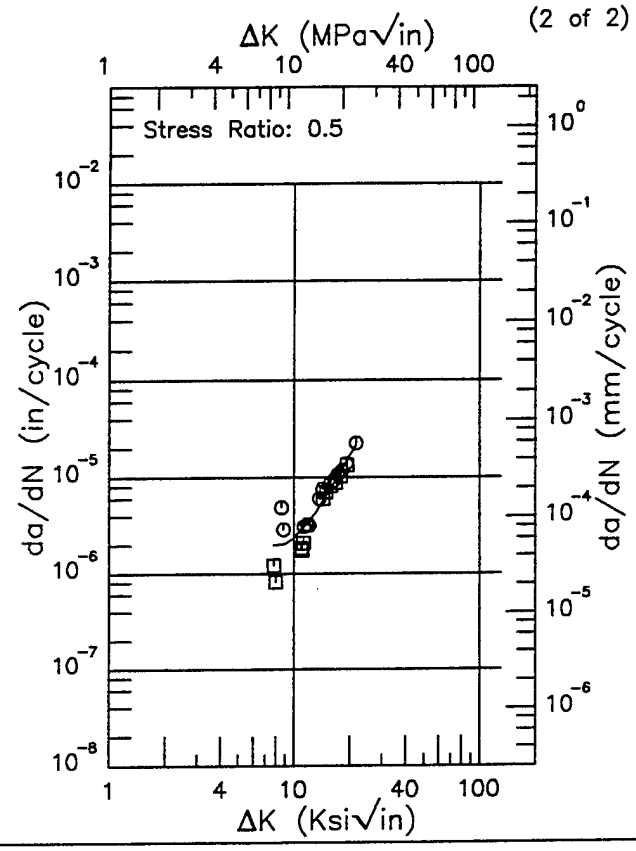
R

Ti-5-2.5 ELI

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R-C
Frequency: 0.1 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.746 - 0.749 in.
Specimen Width: 2.004 - 2.013 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.17 (min)	3.52
16.	6.43
20.	11.4
25.	19.3
30.	30.1
35.	46.2
40.	70.8
49.57 (max)	164.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.78 (min)	1.99
8.	1.98
9.	2.07
10.	2.35
13.	4.21
16.	7.97
20.	16.8
21.59 (max)	21.5

RMS % Error	Life Prediction Ratio Summary
13.44	0. .5 .8 1.25 2.

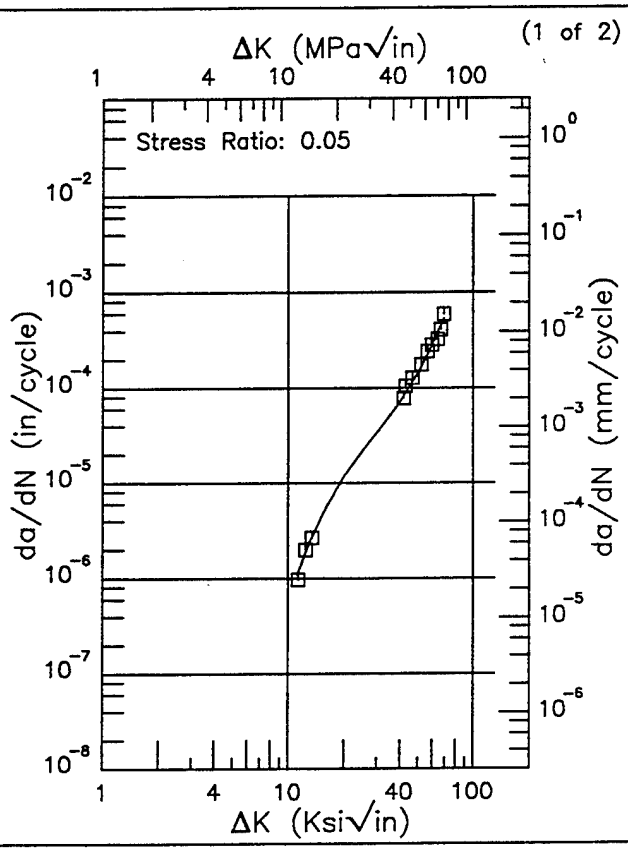
RMS % Error	Life Prediction Ratio Summary
37.44	0. .5 .8 1.25 2.

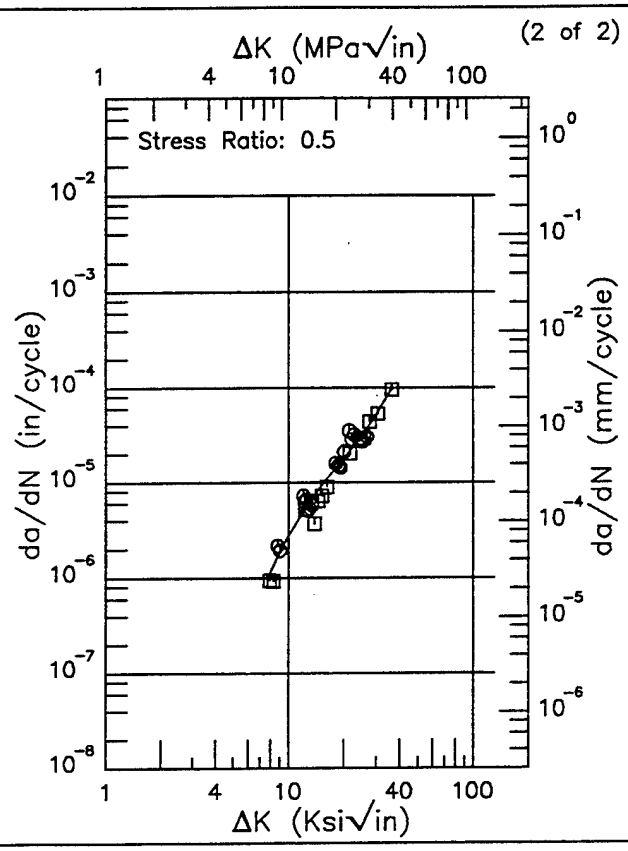
Figure 6.10.3.1.3

Ti–5–2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R–C
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.745 – 0.749 in.
Specimen Width: 2 – 2.005 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.23 (min)	1.09
13.	2.32
16.	5.54
20.	11.6
25.	21.5
30.	33.9
35.	50.0
40.	71.5
50.	142.
60.	283.
69.25 (max)	542.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.91 (min)	1.09
8.	1.14
9.	1.87
10.	2.76
13.	6.17
16.	10.5
20.	17.8
25.	30.9
30.	51.8
35.	86.6
36.03 (max)	96.3

RMS % Error	Life Prediction Ratio Summary
9.74	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
23.13	0. .5 .8 1.25 2.

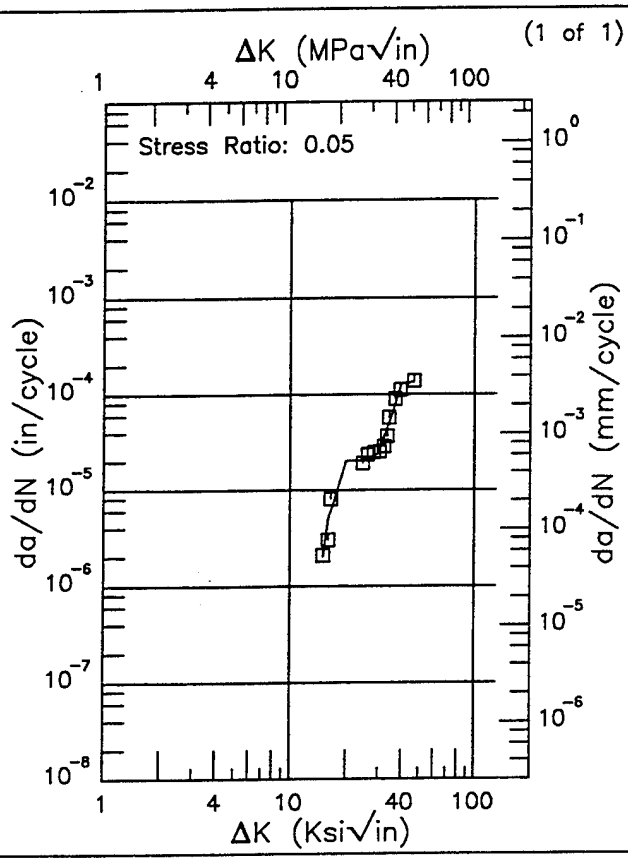
Figure 6.10.3.1.4

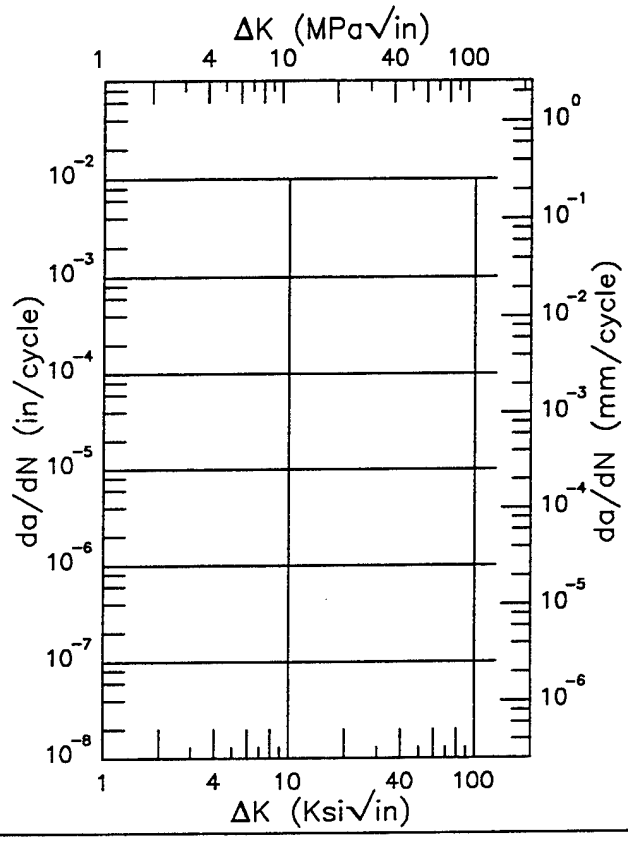
R

Ti-5-2.5 ELI

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C-R
Frequency: 0.1 Hz
Environment: LIQUID HYDROGEN;-423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.749 in.
Specimen Width: 2.004 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.99 (min)	2.03
16.	5.06
20.	20.2
25.	20.4
30.	24.5
35.	58.2
40.	130.
46.57 (max)	135.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
15.84	0. .5 .8 1.25 2.

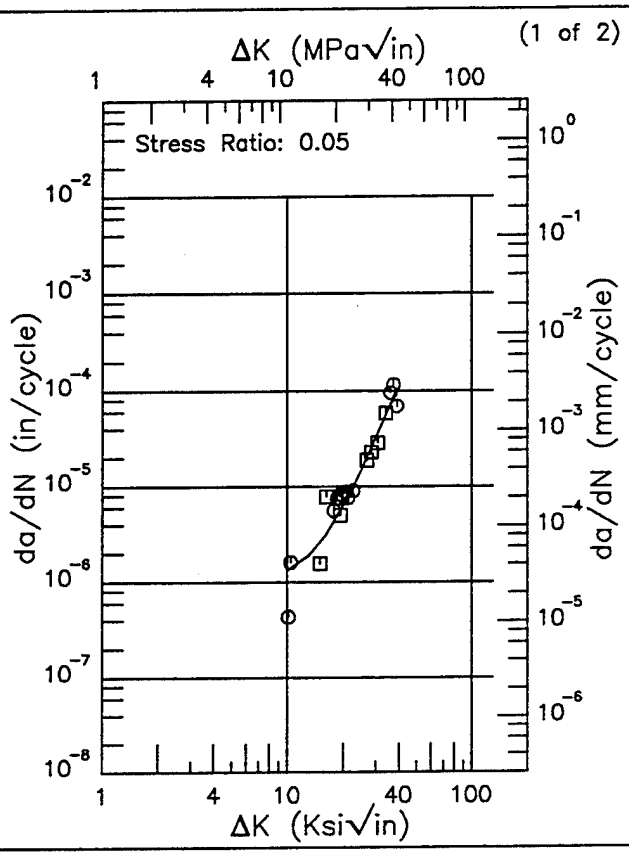
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

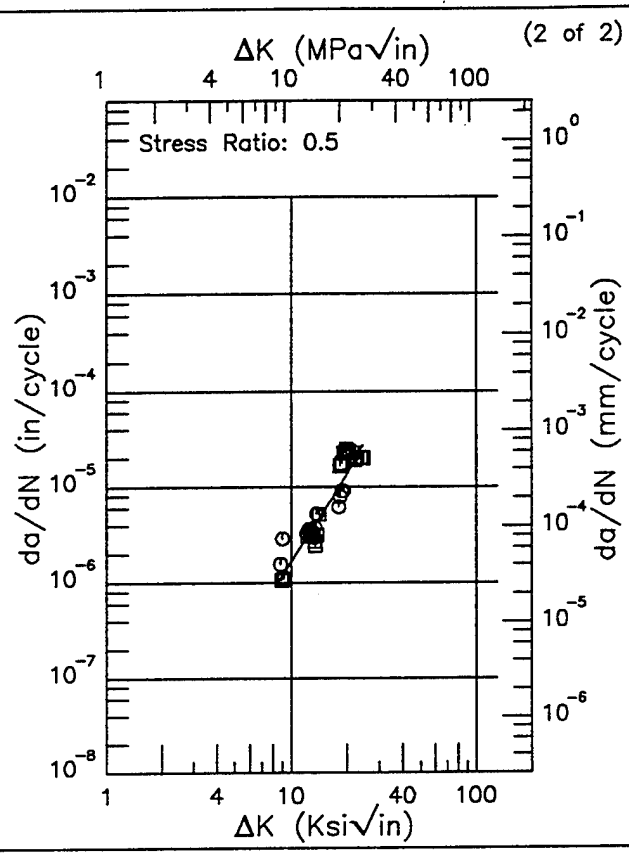
Figure 6.10.3.1.5

Ti–5–2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C–R
Frequency: 10 Hz
Environment: LIQUID HYDROGEN;–423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.744 – 0.747 in.
Specimen Width: 2.004 – 2.008 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.10 (min)	1.34
13.	1.87
16.	3.08
20.	6.32
25.	15.0
30.	32.7
35.	65.4
38.83 (max)	105.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.73 (min)	1.08
9.	1.19
10.	1.65
13.	3.62
16.	6.73
20.	13.6
24.45 (max)	27.3

RMS % Error	Life Prediction Ratio Summary
44.37	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
41.95	0. .5 .8 1.25 2.

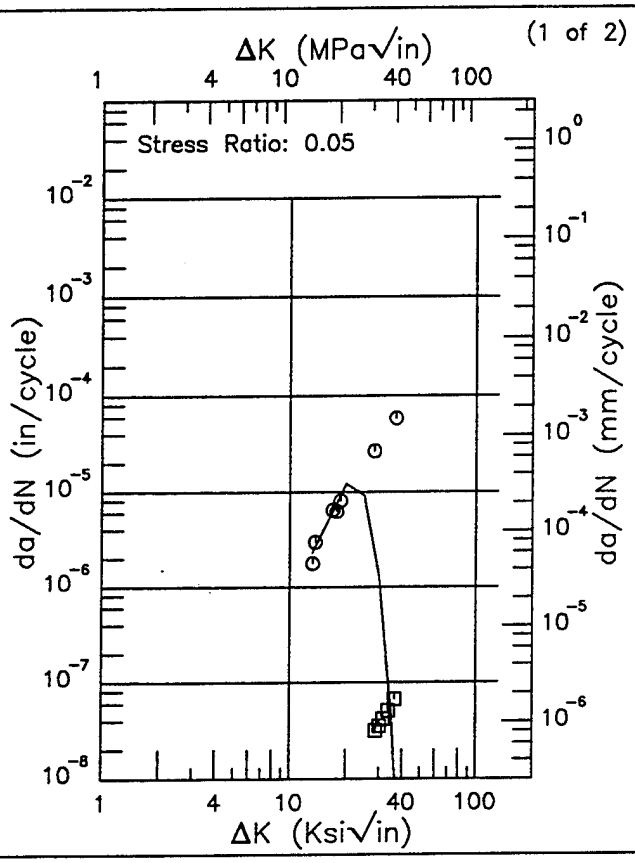
Figure 6.10.3.1.6

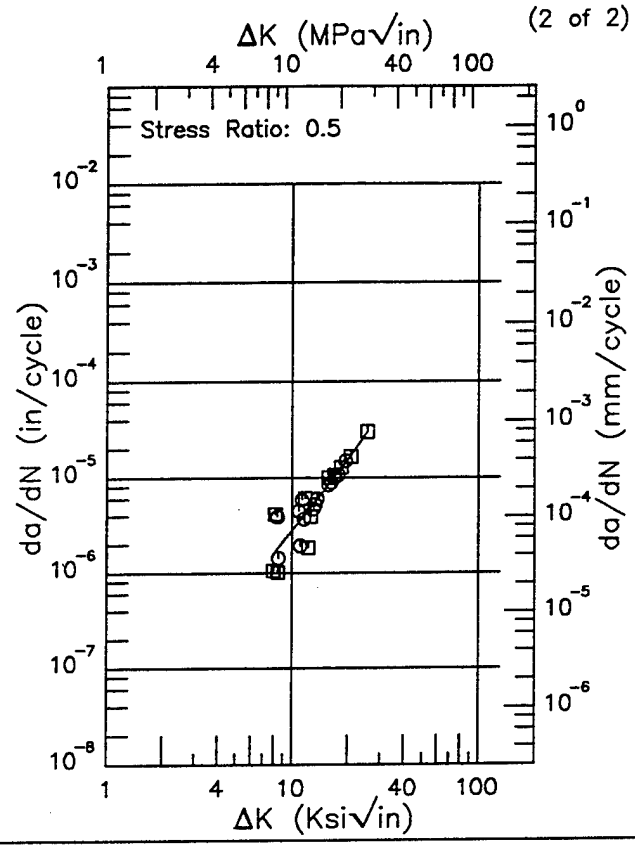
Ti-5-2.5 ELI

R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C-R
Frequency: 0.1 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.745 - 0.748 in.
Specimen Width: 2.004 - 2.008 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.16 (min)	2.30
16.	5.11
20.	12.3
25.	9.06
30.	1.28
35.	0.0435
36.74 (max)	0.0101

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.95 (min)	1.57
8.	1.59
9.	2.15
10.	2.79
13.	5.25
16.	8.68
20.	15.3
25.	28.5
25.45 (max)	30.0

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

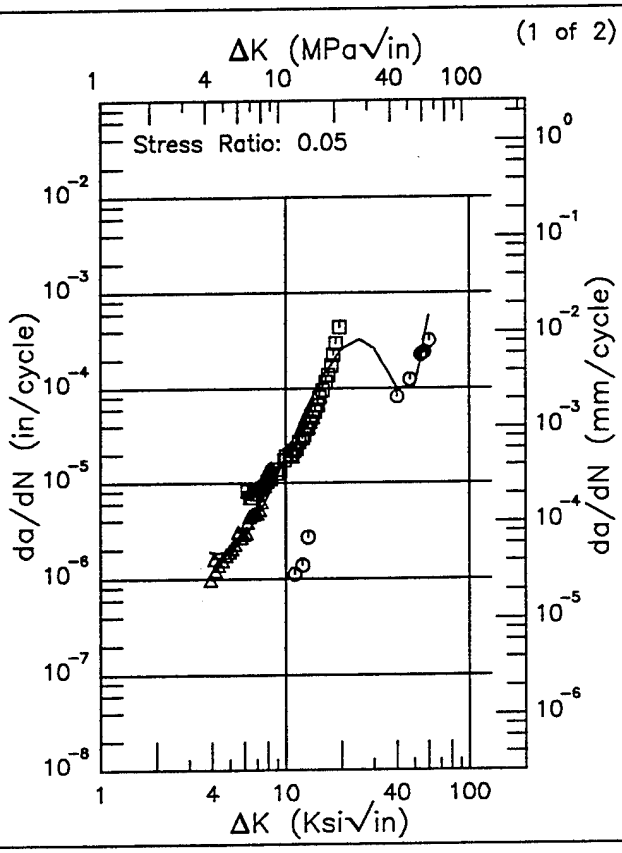
RMS % Error	Life Prediction Ratio Summary
45.63	0. .5 .8 1.25 2.

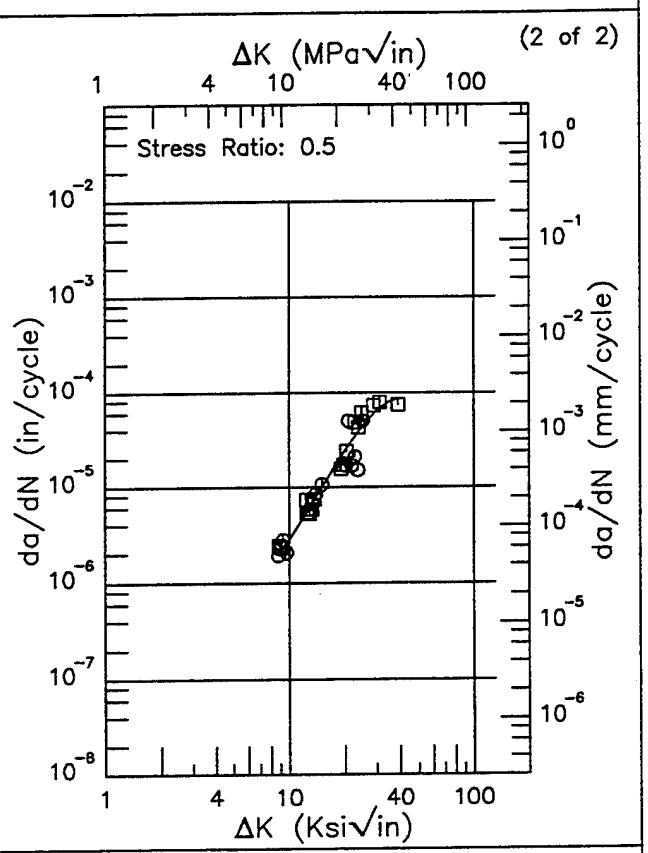
Figure 6.10.3.1.7

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C-R
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.744 – 0.753 in.
Specimen Width: 2.002 – 2.01 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.89 (min)	1.90
4.	1.83
5.	1.88
6.	2.69
7.	4.37
8.	7.32
9.	12.1
10.	19.5
13.	63.1
16.	142.
20.	262.
25.	325.
30.	262.
35.	159.
40.	100.
50.	107.
59.86 (max)	577.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.70 (min)	1.96
9.	2.13
10.	2.81
13.	6.18
16.	12.1
20.	24.2
25.	44.3
30.	64.8
35.	80.3
38.87 (max)	86.7

RMS % Error	Life Prediction Ratio Summary
50.67	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
29.98	0. .5 .8 1.25 2.

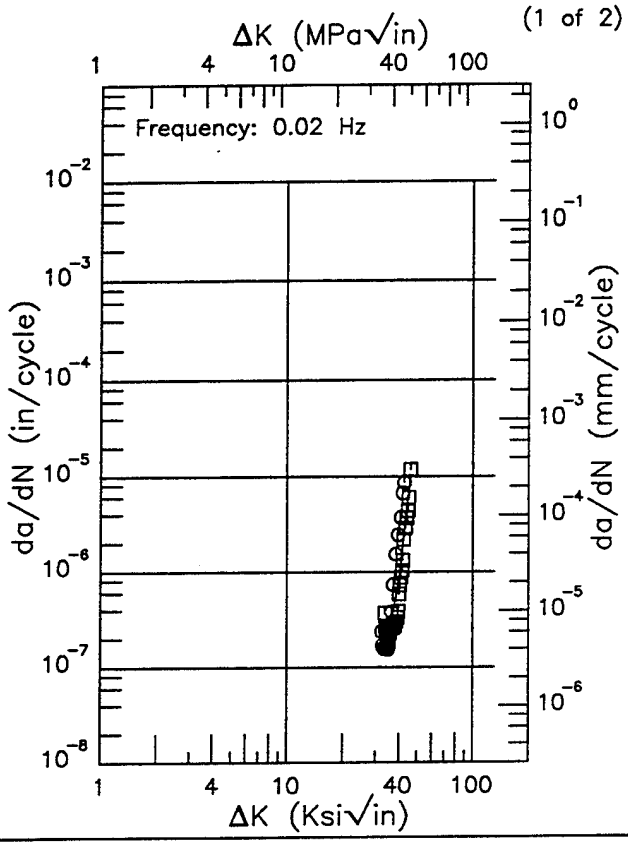
Figure 6.10.3.1.8

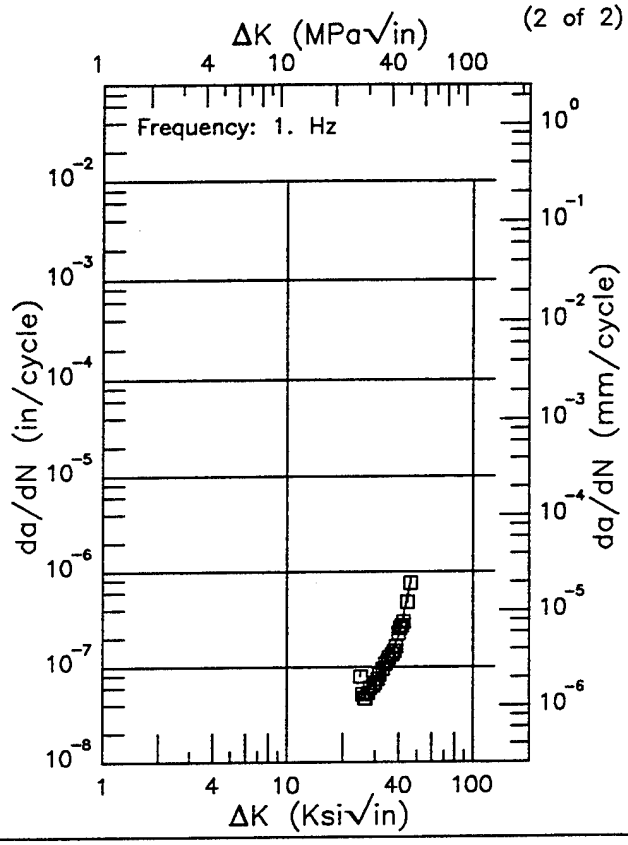
Ti-5-2.5 ELI

F

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C-R
Stress Ratio: 0.5
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.746 – 0.752 in.
Specimen Width: 2.006 – 2.012 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
32.21 (min)	0.212
35.	0.197
40.	0.855
46.00 (max)	10.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
24.90 (min)	0.0555
25.	0.0552
30.	0.0672
35.	0.120
40.	0.213
46.12 (max)	0.744

RMS % Error	Life Prediction Ratio Summary
81.47	0. .5 .8 1.25 2.

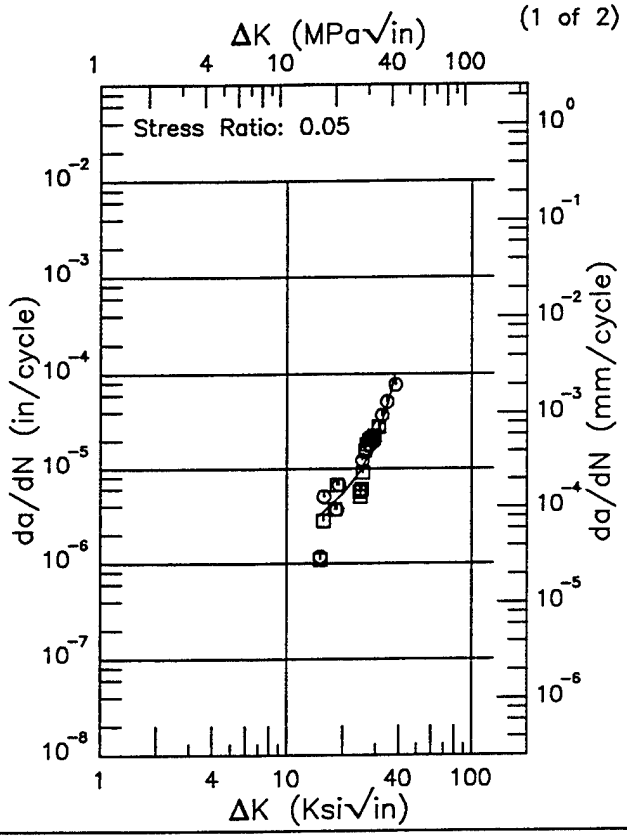
RMS % Error	Life Prediction Ratio Summary
12.91	0. .5 .8 1.25 2.

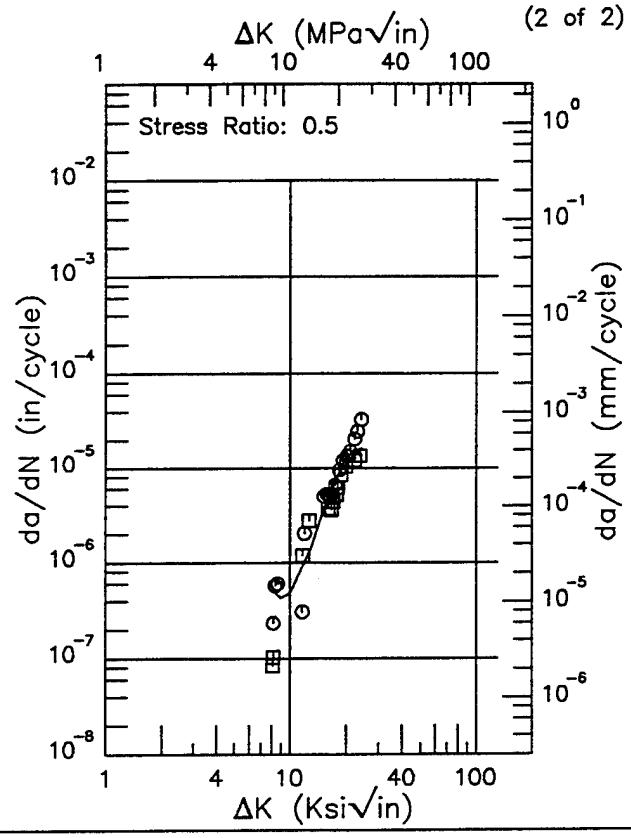
Figure 6.10.3.1.9

Ti–5–2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C–S
Frequency: 10 Hz
Environment: LIQUID HYDROGEN;–423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.745 – 0.747 in.
Specimen Width: 2.006 – 2.012 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.02 (min)	3.18
16.	3.56
20.	5.40
25.	9.69
30.	20.5
35.	50.8
38.28 (max)	99.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.03 (min)	0.514
9.	0.426
10.	0.480
13.	1.45
16.	4.81
20.	13.3
24.09 (max)	16.4

RMS % Error	Life Prediction Ratio Summary
32.43	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
47.38	0. .5 .8 1.25 2.

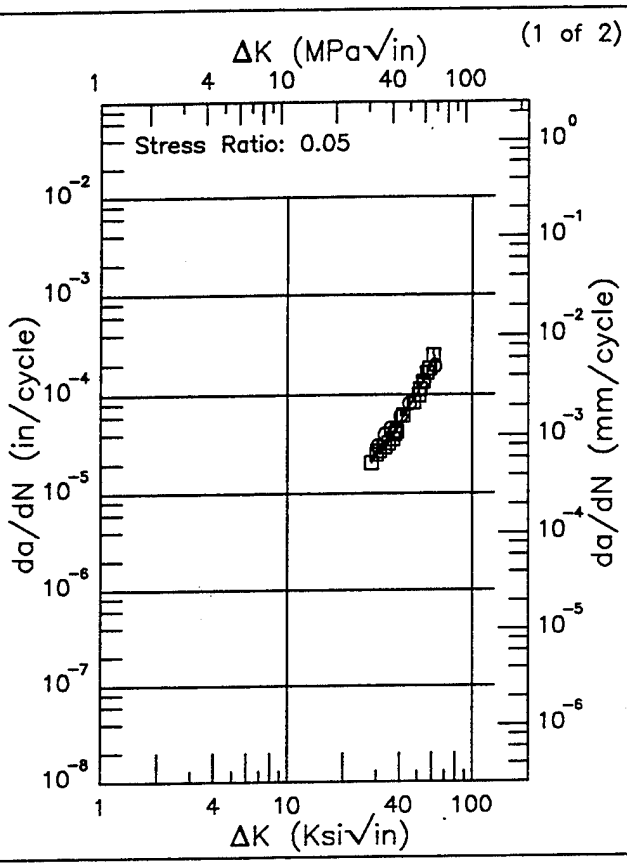
Figure 6.10.3.1.10

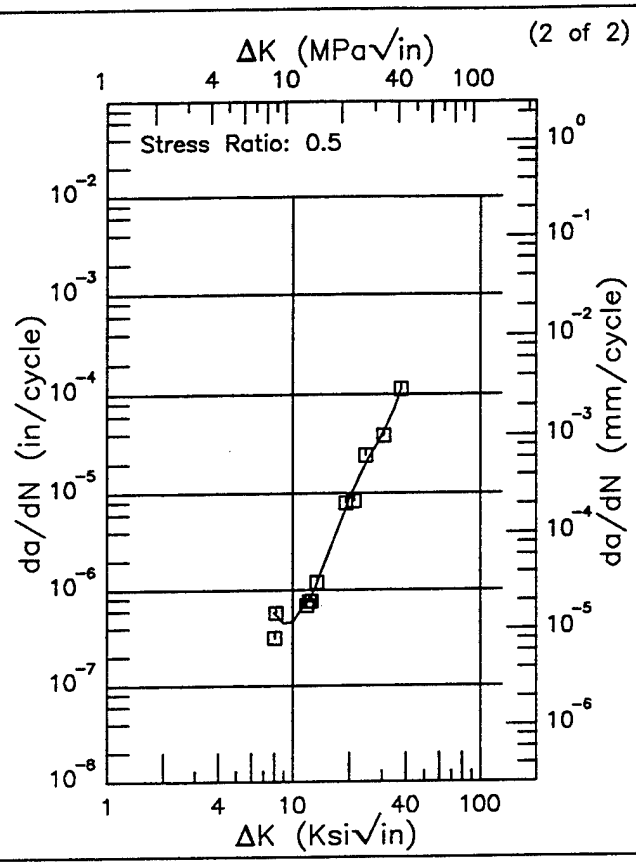
R

Ti-5-2.5 ELI

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C-S
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.743 - 0.75 in.
Specimen Width: 2.004 - 2.01 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
28.32 (min)	21.3
30.	24.8
35.	36.8
40.	52.0
50.	102.
60.	207.
62.09 (max)	242.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.98 (min)	0.582
8.	0.577
9.	0.454
10.	0.463
13.	0.991
16.	2.76
20.	8.85
25.	21.7
30.	38.7
35.	74.1
37.48 (max)	110.

RMS % Error	Life Prediction Ratio Summary
10.75	0. .5 .8 1.25 2.

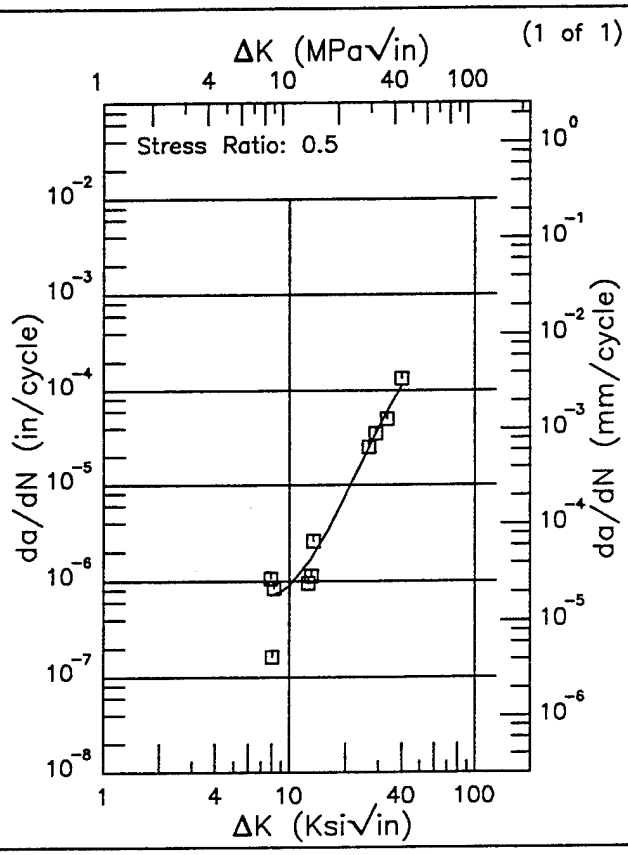
RMS % Error	Life Prediction Ratio Summary
18.66	0. .5 .8 1.25 2.

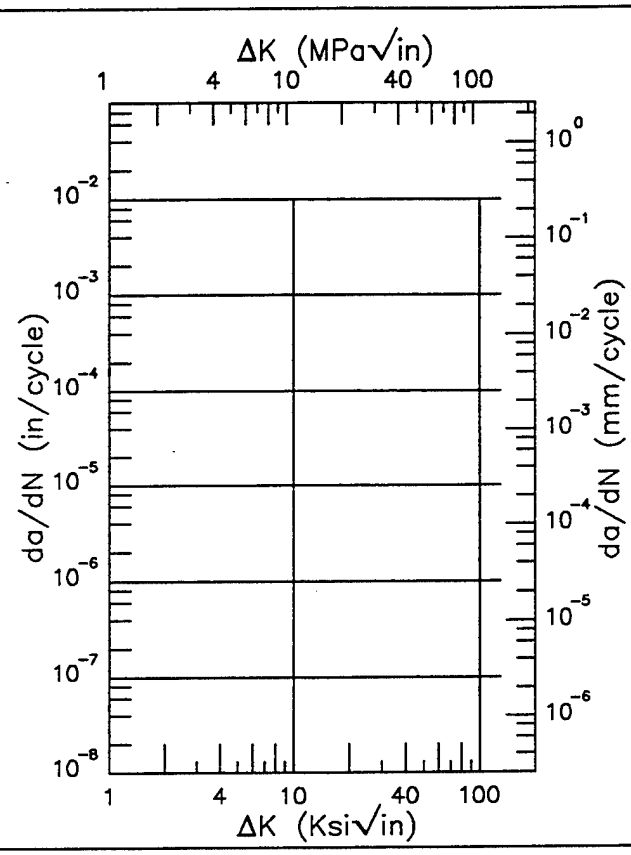
Figure 6.10.3.1.11

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: C-S
Frequency: 0.1 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.749 in.
Specimen Width: 2.01 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.95 (min)	0.718
8.	0.719
9.	0.777
10.	0.899
13.	1.67
16.	3.30
20.	7.78
25.	19.3
30.	40.1
35.	71.5
39.74 (max)	110.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
36.15	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

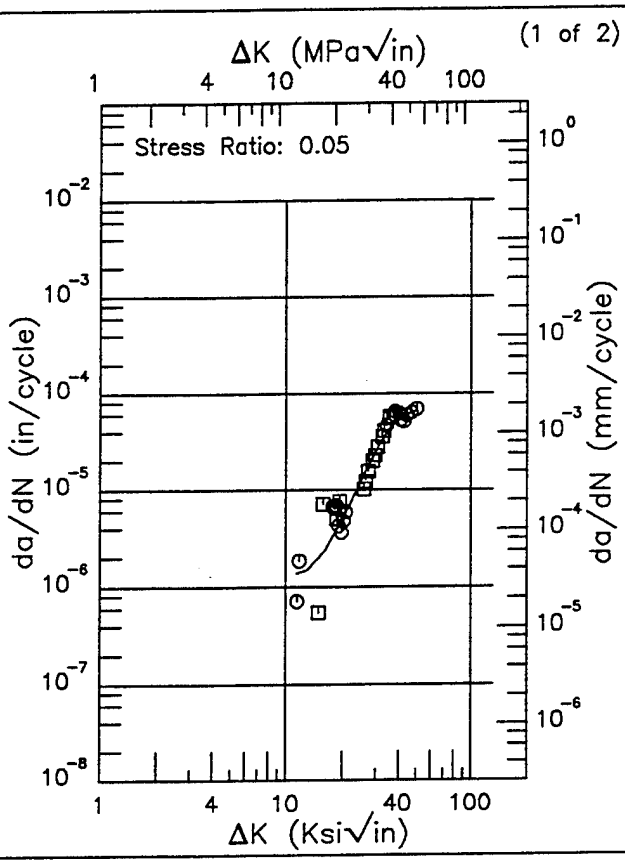
Figure 6.10.3.1.12

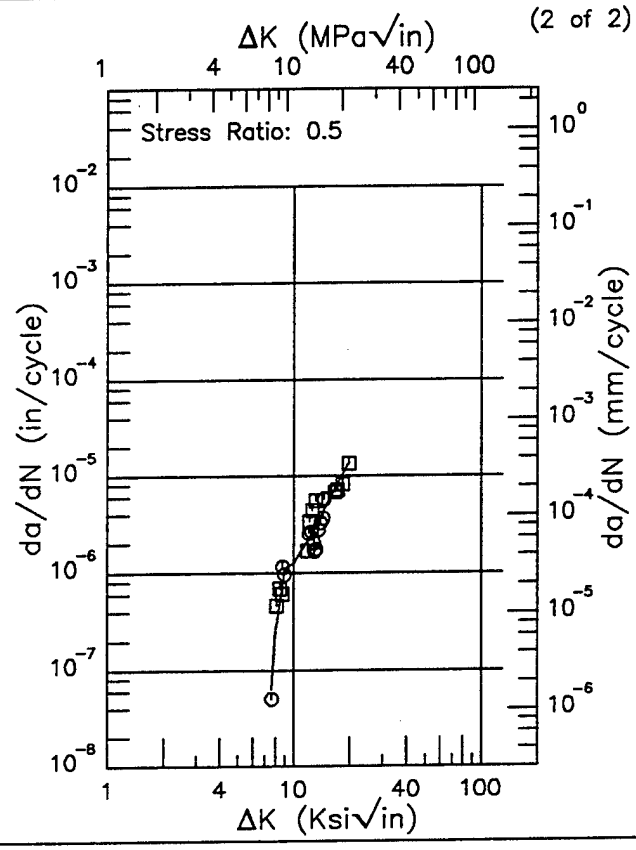
R

Ti-5-2.5 ELI

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S-C
Frequency: 10 Hz
Environment: LIQUID HYDROGEN;-423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.744 - 0.748 in.
Specimen Width: 2.004 - 2.005 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.42 (min)	1.38
13.	1.49
16.	2.31
20.	5.00
25.	12.3
30.	25.0
35.	41.1
40.	56.1
50.	65.8
50.14 (max)	65.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.59 (min)	0.0629
8.	0.264
9.	1.11
10.	1.26
13.	2.81
16.	6.29
19.69 (max)	13.3

RMS % Error	Life Prediction Ratio Summary
54.15	0. .5 .8 1.25 2.

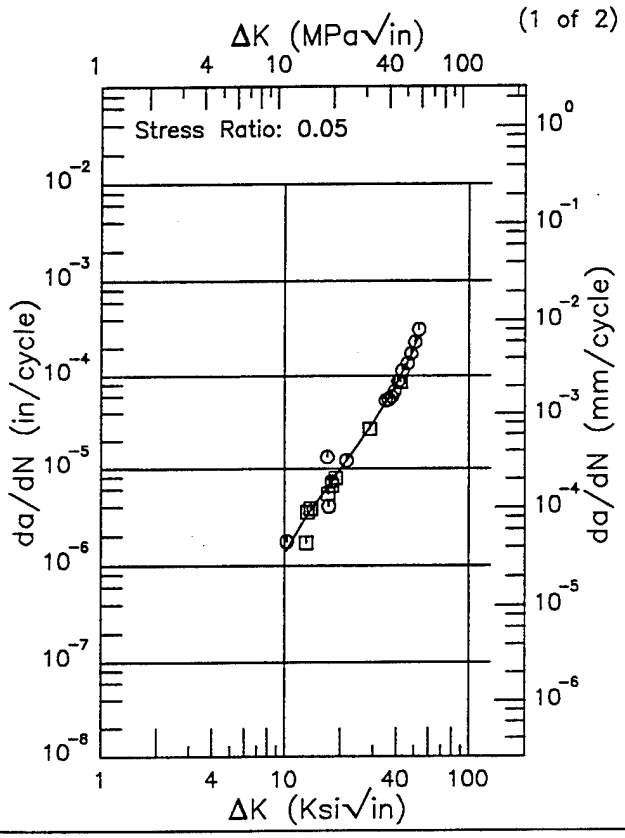
RMS % Error	Life Prediction Ratio Summary
36.79	0. .5 .8 1.25 2.

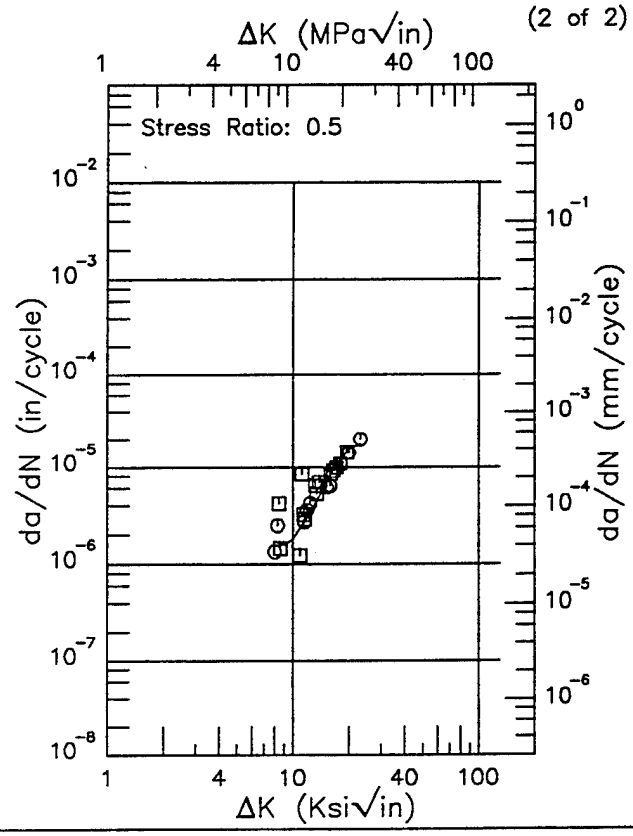
Figure 6.10.3.1.13

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S-C
Frequency: 0.1 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.743 – 0.748 in.
Specimen Width: 2.005 – 2.01 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.22 (min)	1.42
13.	3.01
16.	5.41
20.	9.90
25.	18.3
30.	31.4
35.	51.5
40.	82.3
50.	201.
52.94 (max)	258.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.97 (min)	1.71
8.	1.70
9.	1.59
10.	1.80
13.	3.92
16.	8.52
20.	15.8
22.95 (max)	17.5

RMS % Error	Life Prediction Ratio Summary
27.79	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
60.56	0. .5 .8 1.25 2.

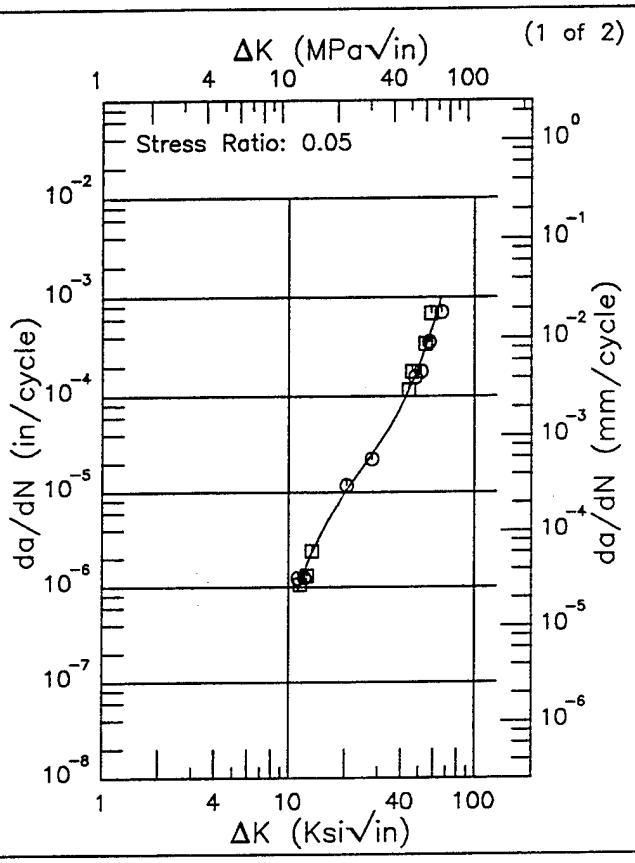
Figure 6.10.3.1.14

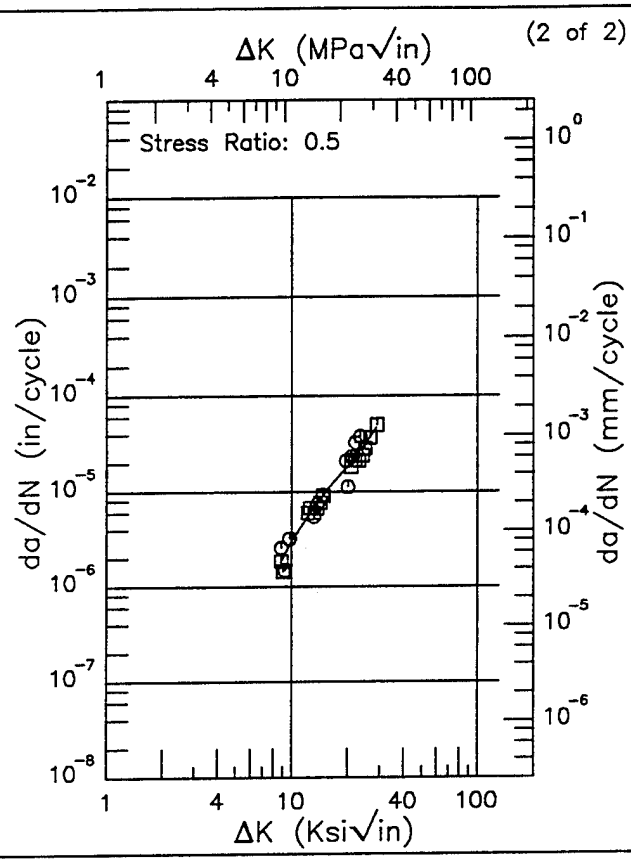
Ti-5-2.5 ELI

R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S-C
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.743 – 0.75 in.
Specimen Width: 2.003 – 2.012 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.14 (min)	0.907
13.	2.04
16.	4.86
20.	10.0
25.	18.7
30.	30.7
35.	48.6
40.	76.6
50.	196.
60.	534.
66.19 (max)	1019.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.77 (min)	1.80
9.	2.01
10.	3.00
13.	6.72
16.	11.2
20.	18.5
25.	31.7
28.78 (max)	47.3

RMS % Error	Life Prediction Ratio Summary
21.40	0. .5 .8 1.25 2.

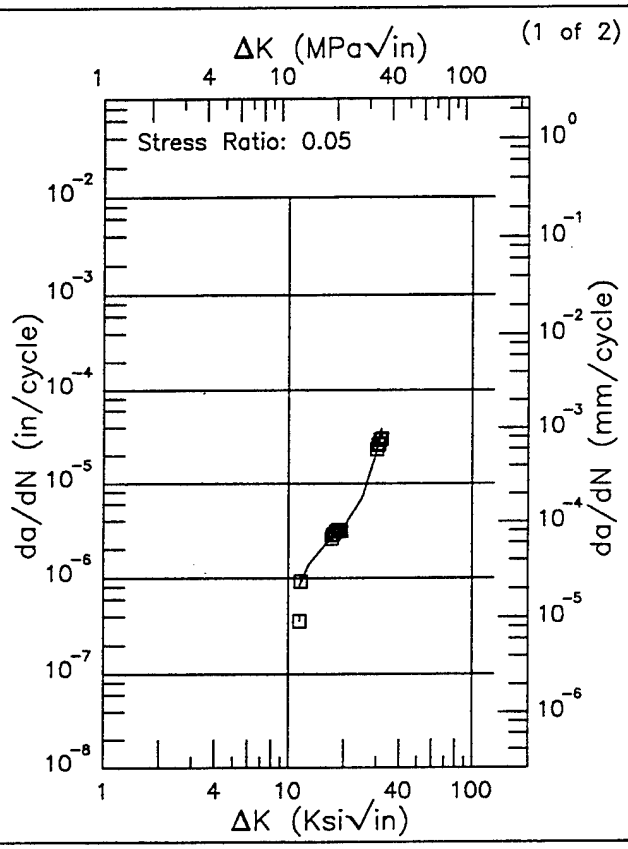
RMS % Error	Life Prediction Ratio Summary
20.94	0. .5 .8 1.25 2.

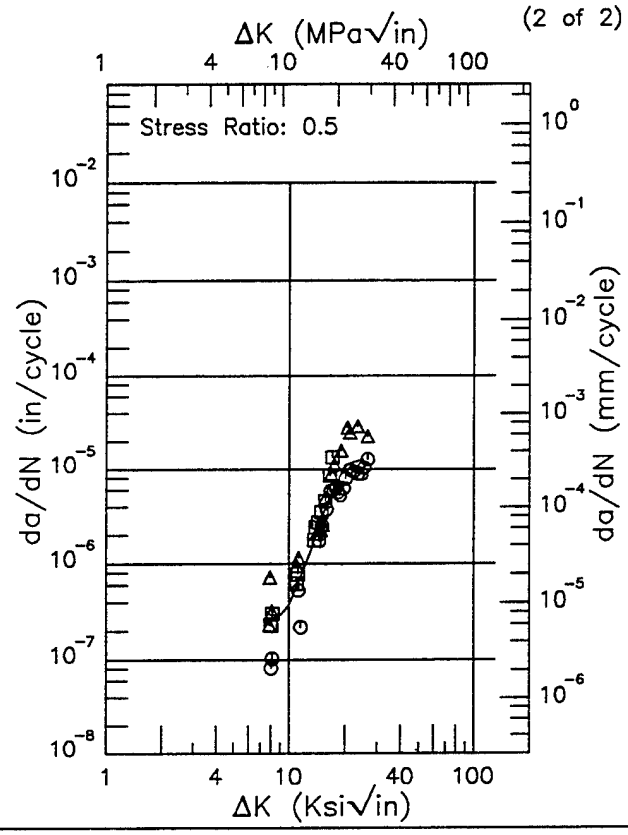
Figure 6.10.3.1.15

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R-S
Frequency: 10 Hz
Environment: LIQUID HYDROGEN;-423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.745 - 0.749 in.
Specimen Width: 1.997 - 2.004 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.47 (min)	0.833
13.	1.39
16.	2.29
20.	3.43
25.	7.02
30.	21.7
32.00 (max)	38.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.79 (min)	0.306
8.	0.291
9.	0.291
10.	0.371
13.	1.29
16.	4.23
20.	11.1
25.	12.7
26.40 (max)	10.9

RMS % Error	Life Prediction Ratio Summary
17.32	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
58.06	0. .5 .8 1.25 2.

Figure 6.10.3.1.16

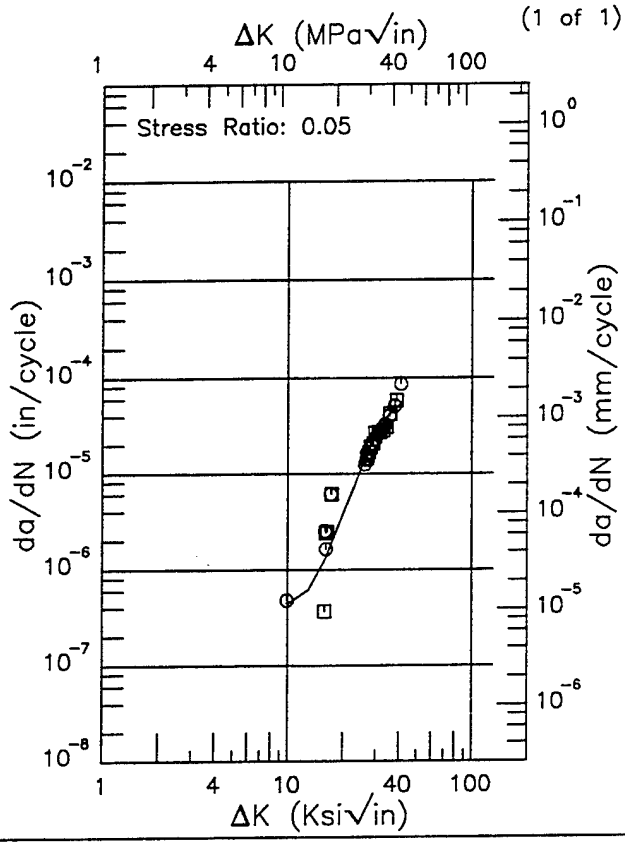
Ti-5-2.5 ELI

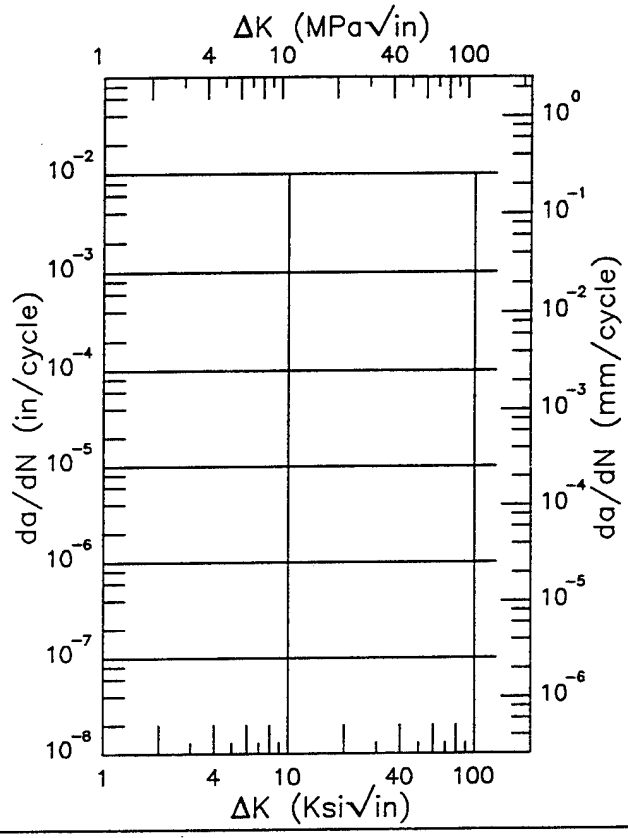
R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R-S
Frequency: 0.1 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.747 in.
Specimen Width: 2.001 – 2.002 in.
Ref: LG005

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.84 (min)	0.447
10.	0.442
13.	0.616
16.	1.30
20.	3.78
25.	11.5
30.	25.4
35.	41.4
40.	52.1
40.84 (max)	53.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
65.02	0. .5 .8 1.25 2.

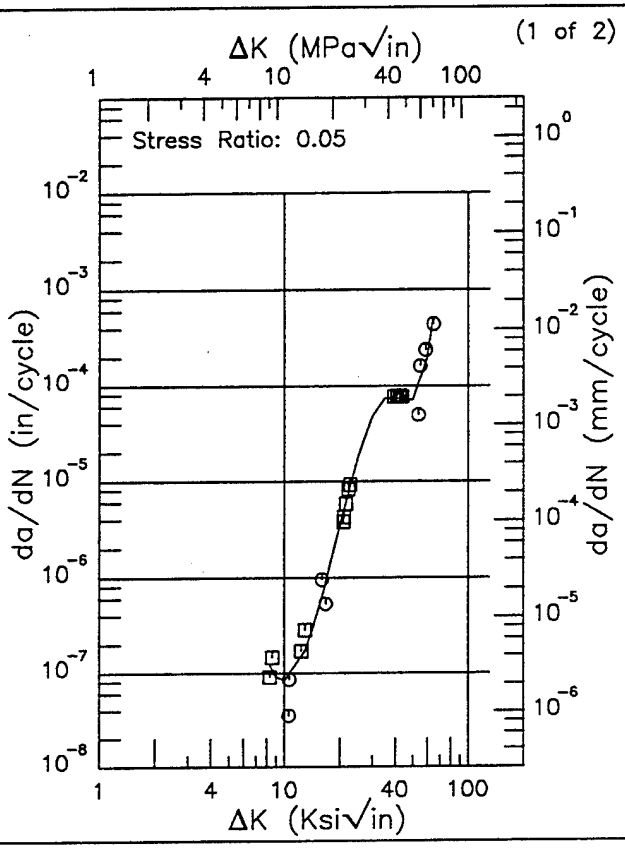
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

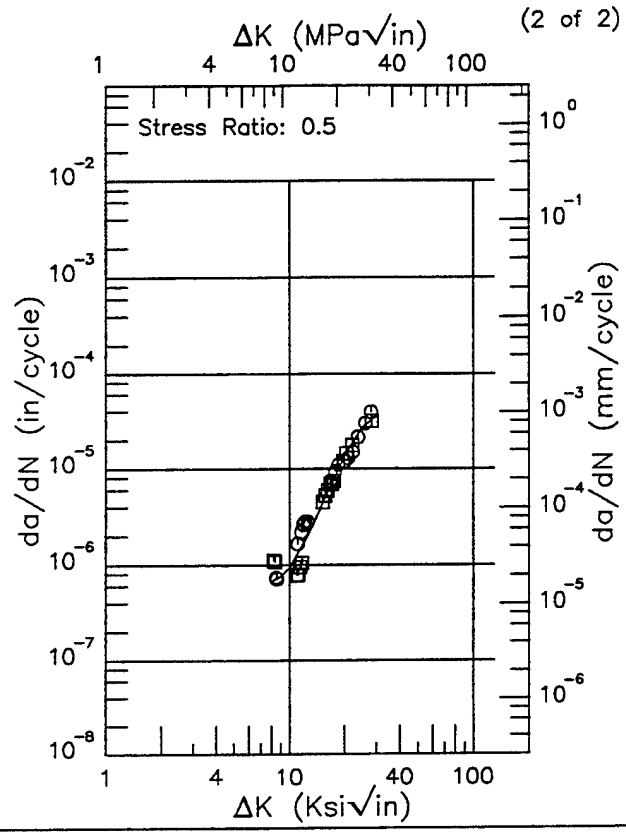
Figure 6.10.3.1.17

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: R-S
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.744 - 0.748 in.
Specimen Width: 1.996 - 2.002 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.28 (min)	0.125
9.	0.0929
10.	0.0830
13.	0.175
16.	0.639
20.	3.48
25.	17.6
30.	47.5
35.	73.4
40.	73.7
50.	71.9
60.	212.
64.25 (max)	515.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.18 (min)	0.691
9.	0.757
10.	0.933
13.	2.25
16.	5.44
20.	13.6
25.	26.6
28.08 (max)	31.9

RMS % Error	Life Prediction Ratio Summary
31.83	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
27.93	0. .5 .8 1.25 2.

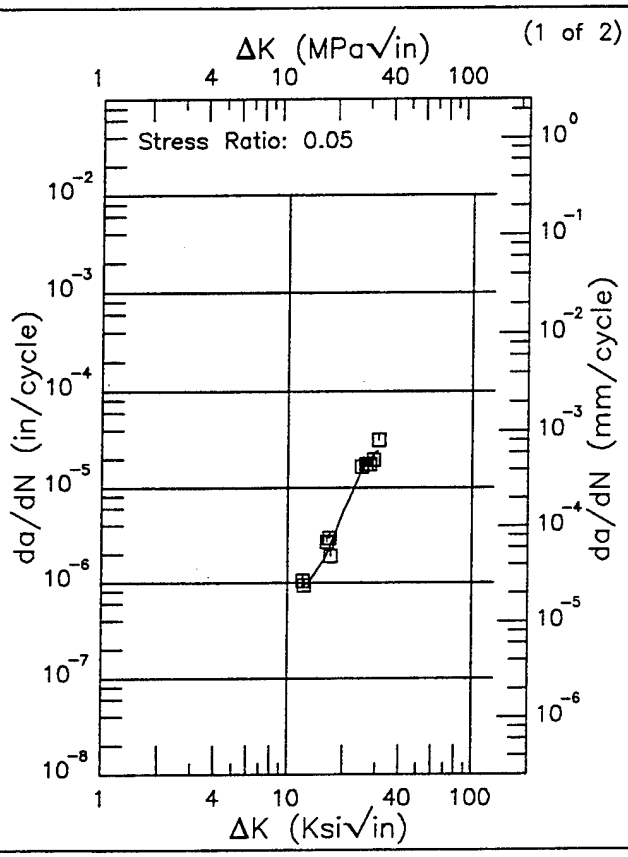
Figure 6.10.3.1.18

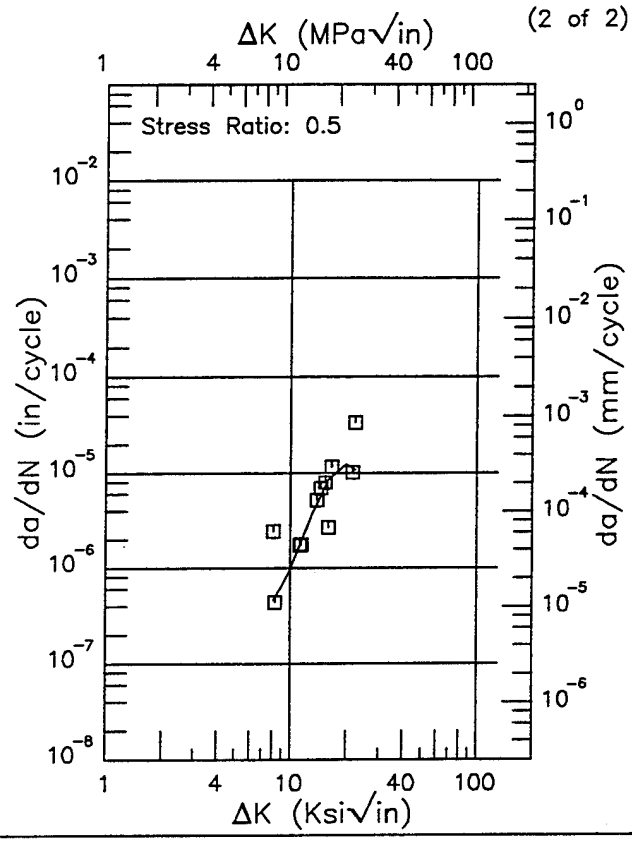
R

Ti–5–2.5 ELI

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S–R
Frequency: 0.1 Hz
Environment: LIQUID HYDROGEN;–423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.746 in.
Specimen Width: 2.003 – 2.006 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.00 (min)	0.942
13.	1.00
16.	1.89
20.	5.56
25.	15.4
30.	24.1
30.73 (max)	24.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.09 (min)	0.466
9.	0.639
10.	0.981
13.	3.53
16.	8.46
20.	12.4
22.27 (max)	10.8

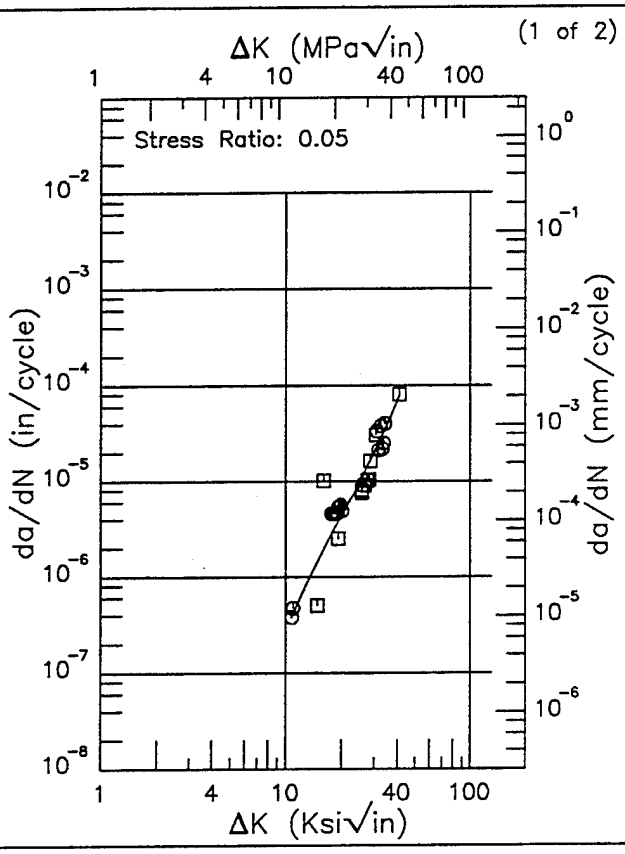
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
18.91	0. .5 .8 1.25 2.	>100.0	0. .5 .8 1.25 2.

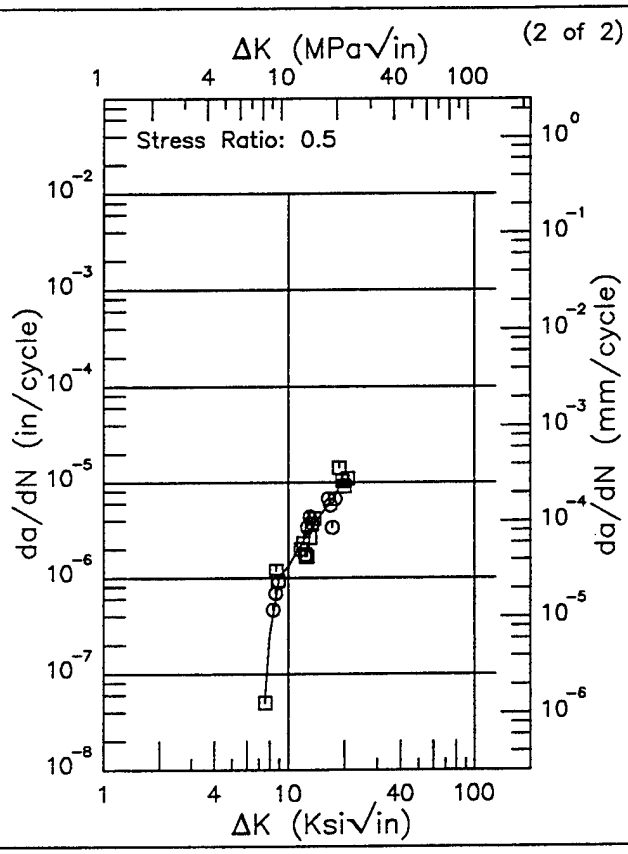
Figure 6.10.3.1.19

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S-R
Frequency: 10 Hz
Environment: LIQUID HYDROGEN;-423°F

Yield Strength: 200 ksi
Ult. Strength: 211.1 ksi
Specimen Thk: 0.744 - 0.748 in.
Specimen Width: 2.004 - 2.011 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.74 (min)	0.376
13.	0.863
16.	1.95
20.	4.42
25.	10.0
30.	20.2
35.	38.4
40.	70.6
40.98 (max)	79.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.49 (min)	0.0505
8.	0.261
9.	1.02
10.	1.32
13.	3.13
16.	5.42
20.	11.0
20.73 (max)	9.71

RMS % Error	Life Prediction Ratio Summary
90.92	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
32.25	0. .5 .8 1.25 2.

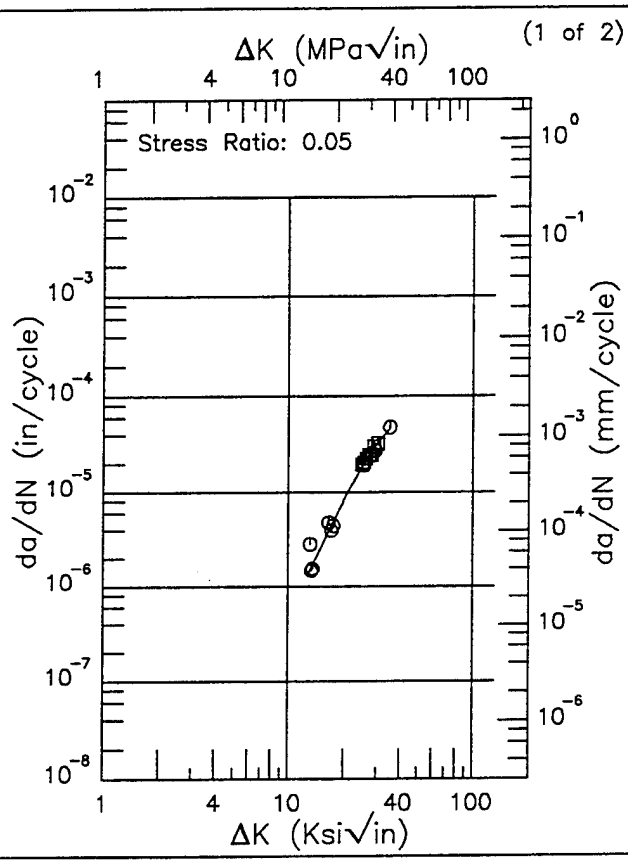
Figure 6.10.3.1.20

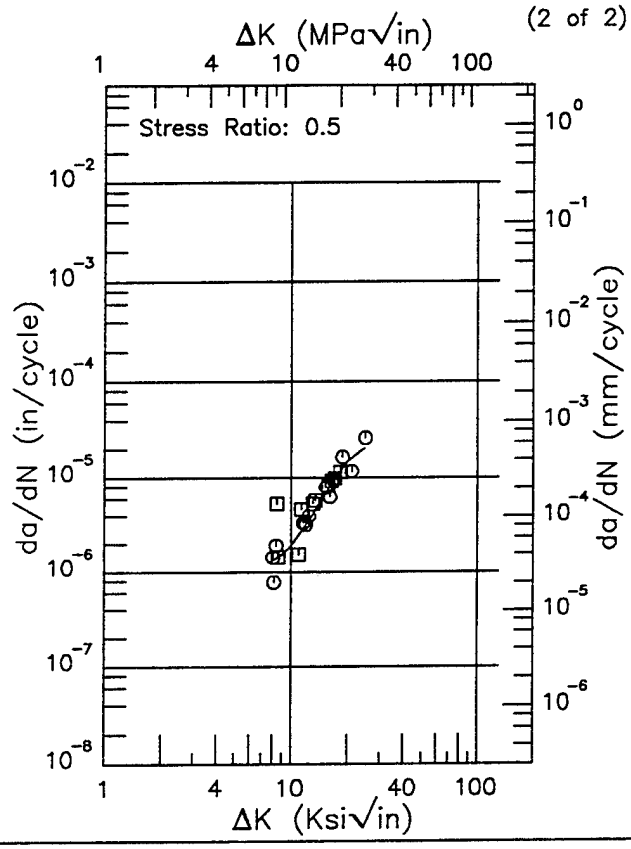
Ti-5-2.5 ELI

R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S-R
Frequency: 0.1 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.746 – 0.749 in.
Specimen Width: 2.004 – 2.009 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.07 (min)	1.45
16.	3.42
20.	8.45
25.	18.9
30.	32.3
35.	45.7
35.29 (max)	46.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.01 (min)	1.34
9.	1.54
10.	1.90
13.	4.03
16.	7.94
20.	14.8
24.82 (max)	20.7

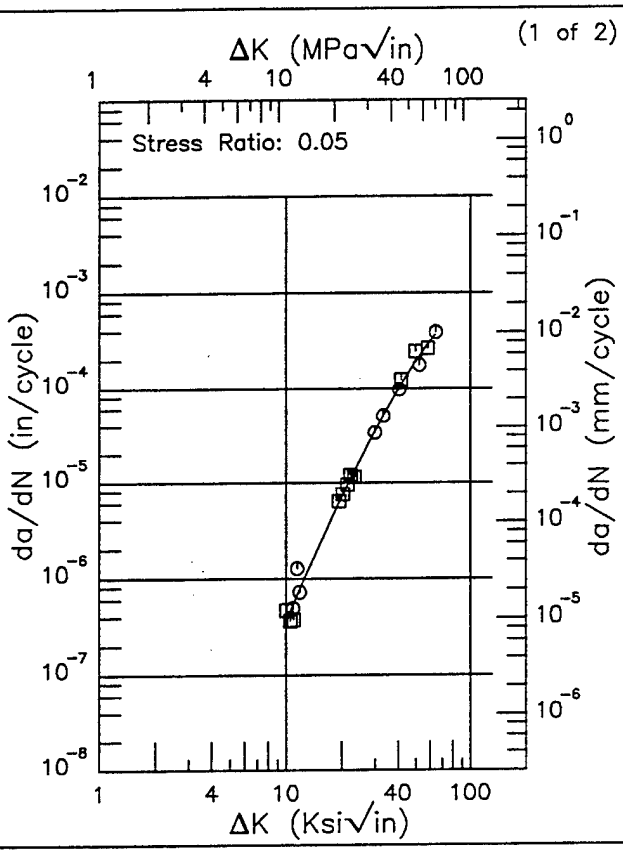
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
24.86	0. .5 .8 1.25 2.	63.62	0. .5 .8 1.25 2.

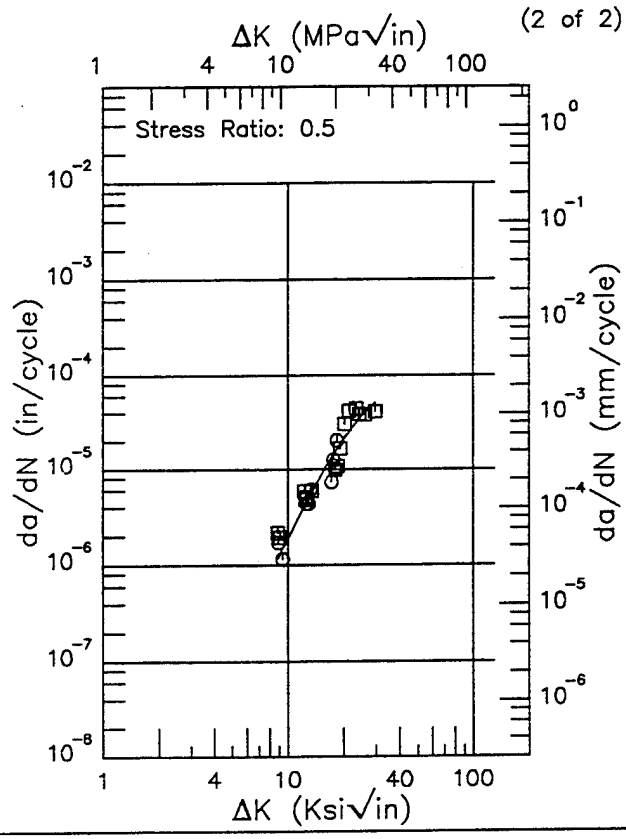
Figure 6.10.3.1.21

Ti-5-2.5 ELI R

Condition/Ht:
Form: 3 in. Disk
Specimen Type: WOL
Orientation: S-R
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 113.6 ksi
Ult. Strength: 120 ksi
Specimen Thk: 0.745 – 0.747 in.
Specimen Width: 2.004 – 2.01 in.
Ref: LG005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.06 (min)	0.381
13.	1.15
16.	2.79
20.	7.15
25.	17.7
30.	35.6
35.	62.3
40.	98.0
50.	194.
60.	315.
64.24 (max)	369.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.80 (min)	1.16
9.	1.26
10.	1.89
13.	5.06
16.	10.5
20.	20.8
25.	36.7
29.54 (max)	50.6

RMS % Error	Life Prediction Ratio Summary
25.23	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
34.86	0. .5 .8 1.25 2.

Figure 6.10.3.1.22

TABLE 6.11.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	50				23.5		
		0.1-0.67	30-55			8.79	28.54	160.44	
		0.67	55		0.29	7.38			

TABLE 6.11.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level ($Ksi\sqrt{in}$)					
				2.5	6.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30					124.12	
		0.1	50				11.77		
		0.67	55		0.25	3.38			

TABLE 6.11.1.2.3

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Dry Argon**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30				5.56	94.72	
		0.1	50				4.77		
		0.67	55-58.3		0.03	0.27			

TABLE 6.11.1.2.4

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30				11.56	123.8	
		0.1	50				11.69		
		0.67	55		0.15	2.17			

TABLE 6.11.1.2.5

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30					177.01	
		0.1	50				24.35		
		0.67	54.2-55		0.7	12.52			

TABLE 6.11.1.2.6

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30				12.51	130.45	
		0.1	50				11.97		
		0.67	55		0.36	3.74			

TABLE 6.11.1.2.7

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Dry Argon**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30				5.38	114.1	
		0.1	50-53.3				5.37		
		0.67	55			0.49			

TABLE 6.11.1.2.8

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-5Al-2.5Sn AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	6.0	10.0	20.0	50.0	100.0
ANNEALED	SHEET	0.1	30				11.18	140.04	
		0.1	50				11.76		
		0.67	55-58.3		0.16	3.08			

TABLE 6.11.2.2

TI-5AL-2.5SN K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} (K_{app} (Ksi√in.)	K_{app} MEAN	K_{app} STAN DEV	K_C (K_C (Ksi√in.)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED	Sheet	0.06	-423	L-T	228.0	1.000	0.062	0.080	---	---	131.10	46.66	55.1	6.0	---	---	---	1971	80104
		0.06			228.0	1.000	0.063	0.410	---	---	63.90	57.34			---			1971	80104
		0.06			228.0	1.000	0.064	0.480	---	---	54.60	55.53			---			1971	80104
		0.06			228.0	1.000	0.064	0.170	---	---	115.50	60.77			---			1971	80104
ANNEALED	Sheet	0.10	-423	L-T	211.0	1.000	0.111	0.120	---	---	161.30	70.66*	74.2	0.4	---	---	---	1971	80104
		0.10			211.0	1.000	0.113	0.360	---	---	90.30	73.90			---			1971	80104
		0.10			211.0	1.000	0.113	0.240	---	---	116.90	74.44			---			1971	80104
ANNEALED	Sheet	0.06	-423	L-T	228.0	2.000	0.062	0.080	---	---	147.10	52.20	59.0	4.9	---	---	---	1971	80104
		0.06			228.0	2.000	0.063	0.140	---	---	123.00	57.86			---			1971	80104
		0.06			228.0	2.000	0.063	0.790	---	---	46.80	57.80			---			1971	80104
		0.06			228.0	2.000	0.063	0.180	---	---	115.10	61.51			---			1971	80104
		0.06			228.0	2.000	0.064	0.420	---	---	78.30	65.39			---			1971	80104
ANNEALED	Sheet	0.10	-423	L-T	211.0	2.000	0.112	0.130	---	---	158.30	71.72*	77.6	1.1	---	---	---	1971	80104
		0.10			211.0	2.000	0.113	0.380	---	---	97.30	76.89			---			1971	80104
		0.10			211.0	2.000	0.114	0.270	---	---	119.00	78.38			---			1971	80104
ANNEALED	Sheet	0.02	-423	L-T	203.5	3.000	0.018	0.500	---	---	110.10	99.28	95.4	2.8	---	115.6	4.9	1967	68968
		0.02			203.5	3.000	0.019	0.540	0.810	---	103.60	97.37			122.41			1967	68968
		0.02			203.5	3.000	0.019	1.040	1.300	---	69.00	95.36			111.85			1967	68968
		0.02			203.5	3.000	0.019	0.150	0.270	---	165.40	80.41*			108.26*			1967	68968

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 6.11.2.2 (CONTINUED)

TI-5AL-2.5SN K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} (K_{app} Ksi√in.)	K_{app} K_{app} MEAN	K_{app} STAN DEV	K_C (K_C Ksi√in.)	K_C K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED Cont'd	Sheet Cont'd	0.02	-423 Cont'd	L-T Cont'd	203.5	3.000	0.019	1.000	---	---	69.30	93.33	Cont'd	Cont'd	---	Cont'd	Cont'd	1967	68968
		0.02			203.5	3.000	0.019	1.020	1.240	---	72.20	98.51			112.90			1967	68968
		0.02			203.5	3.000	0.019	0.320	0.500	---	129.90	92.75			117.13			1967	68968
		0.02			203.5	3.000	0.019	0.340	0.670	---	127.90	94.22			135.40*			1967	68968
		0.02			203.5	3.000	0.019	0.120	0.300	---	181.00	78.66*			125.02*			1967	68968
		0.02			203.5	3.000	0.019	0.510	0.730	---	107.60	98.06			119.62			1967	68968
		0.02			203.5	3.000	0.020	0.150	0.330	---	172.70	83.96*			125.28*			1967	68968
		0.02			203.5	3.000	0.020	0.270	0.470	---	138.90	90.91			121.19*			1967	68968
		0.02			203.5	3.000	0.020	1.030	1.280	---	68.60	94.20			109.88			1967	68968
ANNEALED	Sheet	0.06	-423	L-T	228.0	3.000	0.064	0.990	---	---	48.50	64.89	---	---	---	---	---	1971	80104
ANNEALED	Sheet	0.10	-423	L-T	211.0	3.000	0.116	1.050	---	---	55.20	76.77	77.4	0.9	---	---	---	1971	80104
		0.10			211.0	3.000	0.116	0.990	---	---	58.30	78.01			---			1971	80104
ANNEALED	Sheet	0.02	-423	L-T	203.5	6.000	0.017	2.000	2.390	---	50.10	95.42	94.8	1.8	107.82	109.4	6.6	1967	68968
		0.02			203.5	6.000	0.018	2.010	2.230	---	49.00	93.63			100.40			1967	68968
		0.02			203.5	6.000	0.018	0.130	0.250	---	181.60	82.09*			113.92*			1967	68968
		0.02			203.5	6.000	0.018	0.130	0.220	---	191.90	86.74*			112.90*			1967	68968
		0.02			203.5	6.000	0.018	0.490	0.800	---	105.90	93.29			120.03			1967	68968
		0.02			203.5	6.000	0.018	1.000	1.330	---	73.70	93.98			109.87			1967	68968
		0.02			203.5	6.000	0.018	2.000	2.420	---	48.80	92.95			105.98			1967	68968

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 6.11.2.2 (CONTINUED)

TI-5AL-2.5SN K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{max}	K_{app} (K_{app} (Ksi√in.)	K_{app} MEAN	K_{app} STAN DEV	K_C (K_C (Ksi√in.)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED Cont'd	Sheet Cont'd	0.02	-423 Cont'd	L-T Cont'd	203.5	6.000	0.018	0.490	0.640	---	110.50	97.34	Cont'd	Cont'd	111.58	Cont'd	Cont'd	1967	68968
		0.02			203.5	6.000	0.019	0.240	0.640	---	156.40	96.12			157.92*			1967	68968
		0.02			203.5	6.000	0.019	0.500	0.720	---	109.10	97.10			117.07			1967	68968
		0.02			203.5	6.000	0.019	1.000	1.340	---	74.10	94.49			110.94			1967	68968
		0.02			203.5	6.000	0.019	0.250	0.530	---	153.30	96.17			140.55*			1967	68968
		0.02			203.5	6.000	0.019	1.020	1.210	---	71.40	92.02			100.98			1967	68968
		0.02			203.5	6.000	0.019	0.250	0.610	---	157.20	98.62*			154.87*			1967	68968
ANNEALED	Sheet	0.02	-423	L-T	203.5	12.000	0.018	0.240	0.650	---	154.40	94.82	94.0	3.8	156.30*	107.0	9.0	1967	68968
		0.02			203.5	12.000	0.018	0.500	0.690	---	103.60	91.91			108.08			1967	68968
		0.02			203.5	12.000	0.018	0.490	0.620	---	104.30	91.60			103.10			1967	68968
		0.02			203.5	12.000	0.018	0.980	1.190	---	76.00	94.68			104.54			1967	68968
		0.02			203.5	12.000	0.019	4.000	4.450	---	35.40	95.35			102.42			1967	68968
		0.02			203.5	12.000	0.019	0.130	0.380	---	178.40	80.62*			137.92*			1967	68968
		0.02			203.5	12.000	0.019	0.490	0.660	---	108.60	95.38			110.78			1967	68968
		0.02			203.5	12.000	0.019	2.000	2.410	---	52.10	93.96			103.97			1967	68968
		0.02			203.5	12.000	0.019	1.000	1.170	---	71.30	89.75			97.23			1967	68968
		0.02			203.5	12.000	0.019	2.000	2.460	---	51.20	92.34			103.34			1967	68968
		0.02			203.5	12.000	0.020	4.000	4.040	---	39.20	105.59			106.28			1967	68968
		0.02			203.5	12.000	0.020	0.120	0.260	---	183.90	79.85*			117.56*			1967	68968

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 6.11.2.2 (CONCLUDED)

TI-5AL-2.5SN K_C																			
CONDITION HEAT TREAT	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN		CRACK LENGTH		GROSS STRESS		K_{app}			K_C			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	INIT (in.) $2a_o$	FINAL (in.) $2a_f$	ONSET (Ksi) σ_o	MAX (Ksi) σ_{Max}	K_{app} (Ksi√in.)	K_{app} MEAN	STAN DEV	K_C (Ksi√in.)	K_C MEAN	STAN DEV		
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED Cont'd	Sheet Cont'd	0.02	-423 Cont'd	L-T Cont'd	203.5	12.000	0.020	4.020	4.350	---	35.20	95.12	Cont'd	Cont'd	100.26	Cont'd	Cont'd	1967	68968
		0.02			203.5	12.000	0.020	0.240	0.470	---	153.20	94.09			131.76			1967	68968
		0.02			203.5	12.000	0.020	0.120	0.310	---	181.10	78.63*			126.43*			1967	68968
		0.02			203.5	12.000	0.021	0.240	0.400	---	151.30	92.92			120.01			1967	68968
		0.02			203.5	12.000	0.021	0.990	1.370	---	70.90	88.79			104.85			1967	68968
		0.02			203.5	12.000	0.021	2.000	2.330	---	51.60	93.06			101.08			1967	68968
ANNEALED	Sheet	0.02	-423	L-T	193.3	15.930	0.016	4.980	5.480	---	32.80	97.69	92.3	7.6	103.92	97.1	9.6	1967	68968
		0.02			193.3	15.930	0.019	4.980	5.280	---	29.20	86.97			90.29			1967	68968
ANNEALED	Sheet	0.06	-420	L-T	228.0	3.000	0.064	1.000	---	---	44.90	60.47	---	---	---	---	---	1971	80104
ANNEALED	Sheet	0.02	-320	L-T	171.2	15.940	0.018	5.000	5.400	---	44.60	133.16	---	---	139.93	---	---	1967	68968
ANNEALED	Sheet	0.02	-320	L-T	171.2	16.230	0.020	4.980	5.610	---	44.80	133.11	---	---	143.73	---	---	1967	68968
ANNEALED	Sheet	0.20	R.T.	L-T	110.7	13.880	0.202	4.550	---	---	68.70	196.87*	---	---	---	---	---	1966	66218
ANNEALED	Sheet	0.02	R.T.	L-T	109.3	15.950	0.018	5.060	6.780	---	54.50	163.94	---	---	200.71*	---	---	1967	68968
ANNEALED	Sheet	0.02	R.T.	L-T	109.3	16.390	0.018	5.070	6.660	---	58.70	176.16	---	---	211.86*	---	---	1967	68968
ANNEALED	Sheet	0.02	-423	T-L	211.8	12.000	0.015	1.130	1.390	---	64.70	86.67	83.8	4.0	96.40	107.7	16.0	1966	66103
		0.02			211.8	12.000	0.015	0.330	0.710	---	112.40	80.96			118.96			1966	66103
ANNEALED	Sheet	0.03	-423	T-L	207.3	12.000	0.036	0.280	1.070	---	129.00	85.58	93.7	11.5	168.07	147.6	28.9	1966	66103
		0.03			207.3	12.000	0.036	1.200	1.840	---	73.70	101.81			127.14			1966	66103

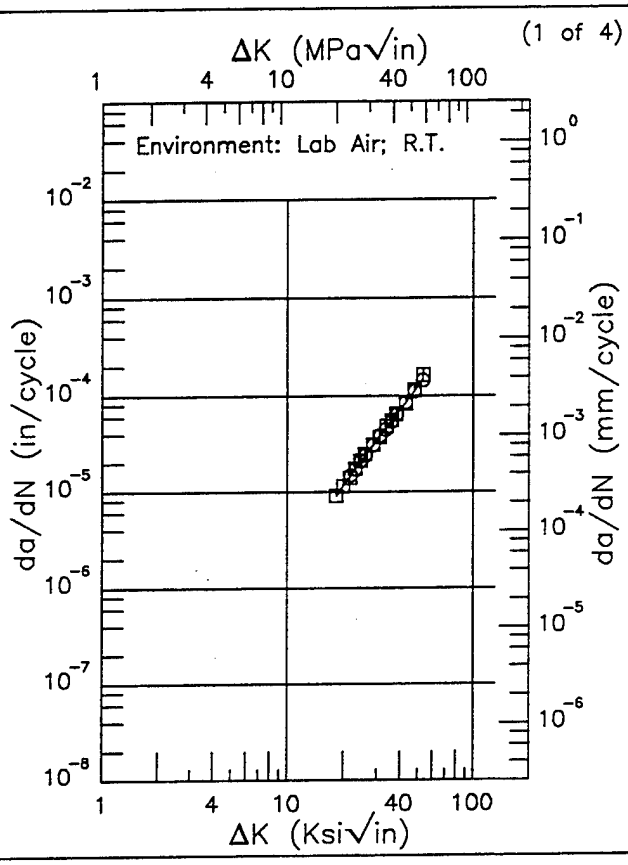
* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

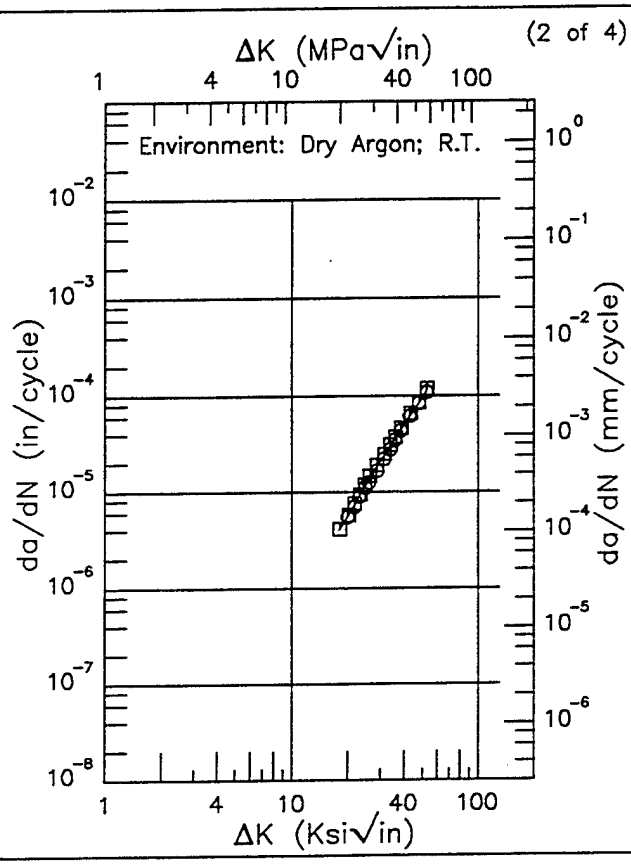
Ti–5Al–2.5Sn

E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.1 – 0.67
Frequency: 30 – 55 Hz

Yield Strength: 122.3 ksi
Ult. Strength: 133.9 ksi
Specimen Thk: 0.083 – 0.084 in.
Specimen Width: 2.754 – 2.764 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.23 (min)	8.92
20.	11.6
25.	21.3
30.	34.5
35.	51.2
40.	71.2
50.	124.
53.30 (max)	146.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.13 (min)	4.02
20.	5.56
25.	11.6
30.	20.8
35.	33.6
40.	50.3
50.	94.7
53.17 (max)	112.

RMS % Error	Life Prediction Ratio Summary
2.77	0. .5 .8 1.25 2.

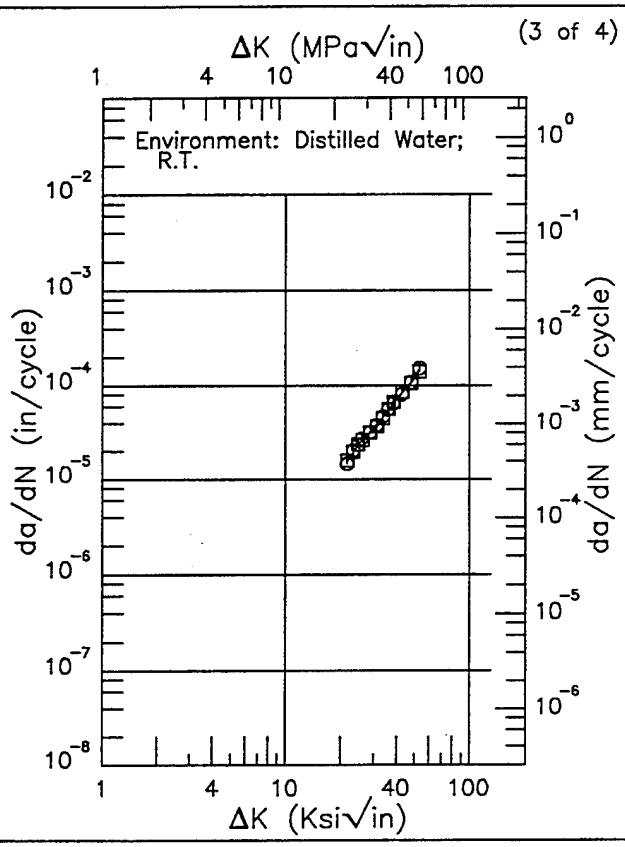
RMS % Error	Life Prediction Ratio Summary
4.05	0. .5 .8 1.25 2.

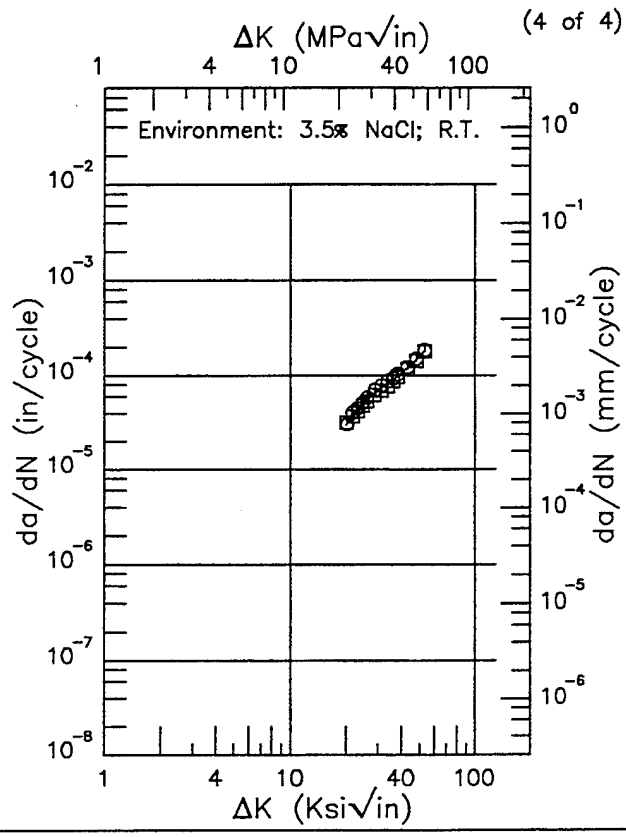
Figure 6.11.3.1.1

Ti–5Al–2.5Sn E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength: 122.3 ksi
Ult. Strength: 133.9 ksi
Specimen Thk: 0.083 – 0.084 in.
Specimen Width: 2.754 – 2.764 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.49 (min)	15.4
25.	24.0
30.	34.9
35.	50.7
40.	72.6
50.	119.
53.14 (max)	152.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
20.00 (min)	29.9
25.	51.4
30.	69.2
35.	86.0
40.	105.
50.	157.
53.17 (max)	179.

RMS % Error	Life Prediction Ratio Summary
3.20	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
4.68	0. .5 .8 1.25 2.

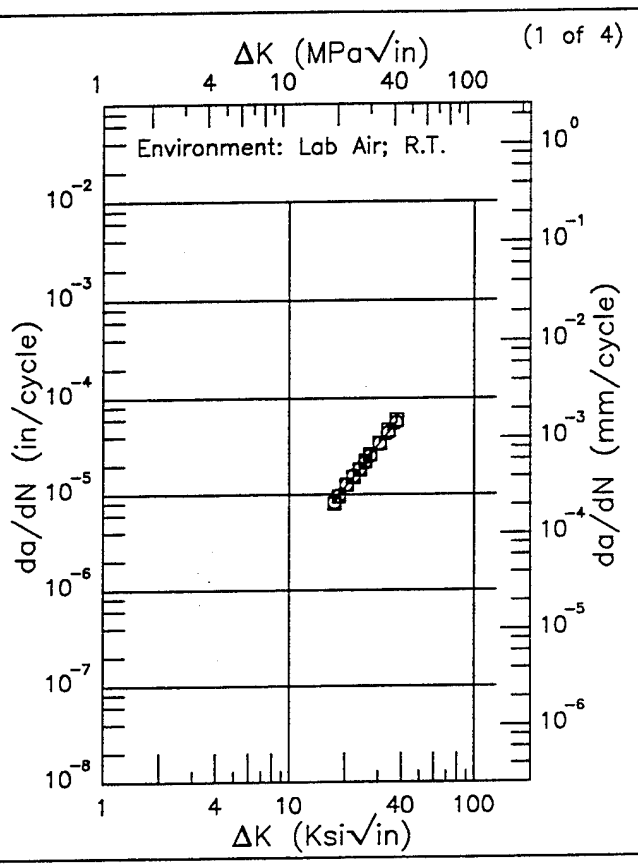
Figure 6.11.3.1.1 (Concluded)

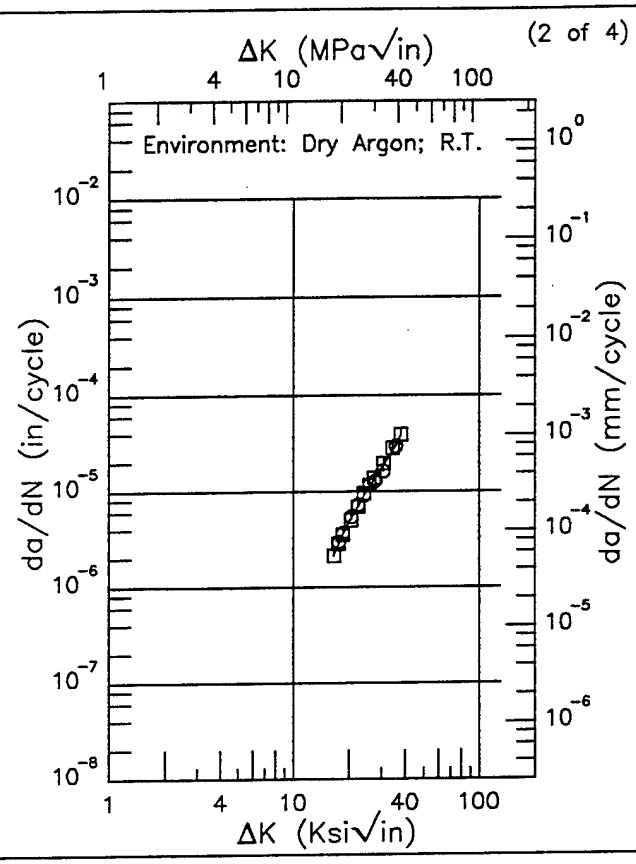
Ti–5Al–2.5Sn

E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.1
Frequency: 50 Hz

Yield Strength: 122.3 ksi
Ult. Strength: 133.9 ksi
Specimen Thk: 0.083 – 0.084 in.
Specimen Width: 2.754 – 2.756 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.50 (min)	8.19
20.	11.7
25.	20.7
30.	32.5
35.	47.3
37.81 (max)	57.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.59 (min)	2.12
20.	4.77
25.	10.0
30.	17.3
35.	28.6
38.01 (max)	38.7

RMS % Error	Life Prediction Ratio Summary
1.82	0. .5 .8 1.25 2.

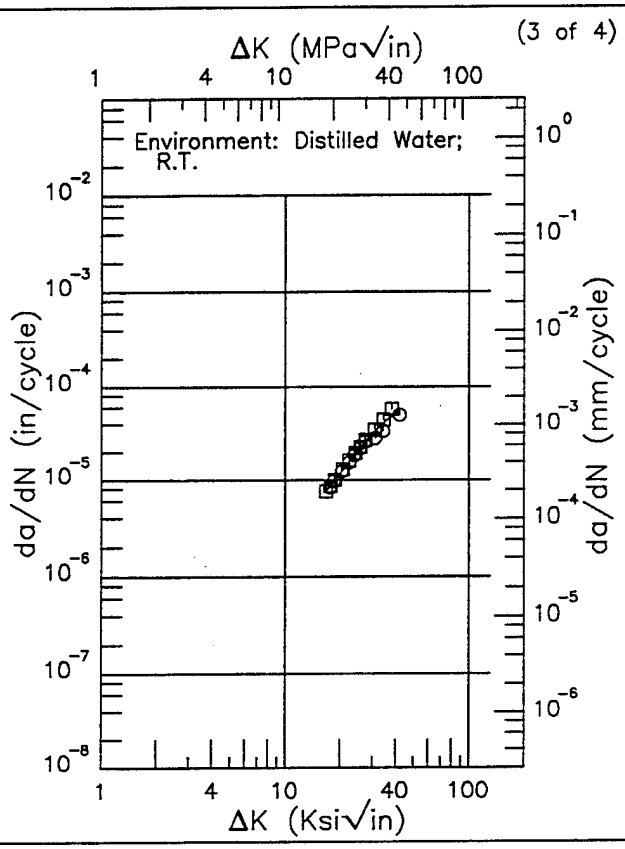
RMS % Error	Life Prediction Ratio Summary
4.62	0. .5 .8 1.25 2.

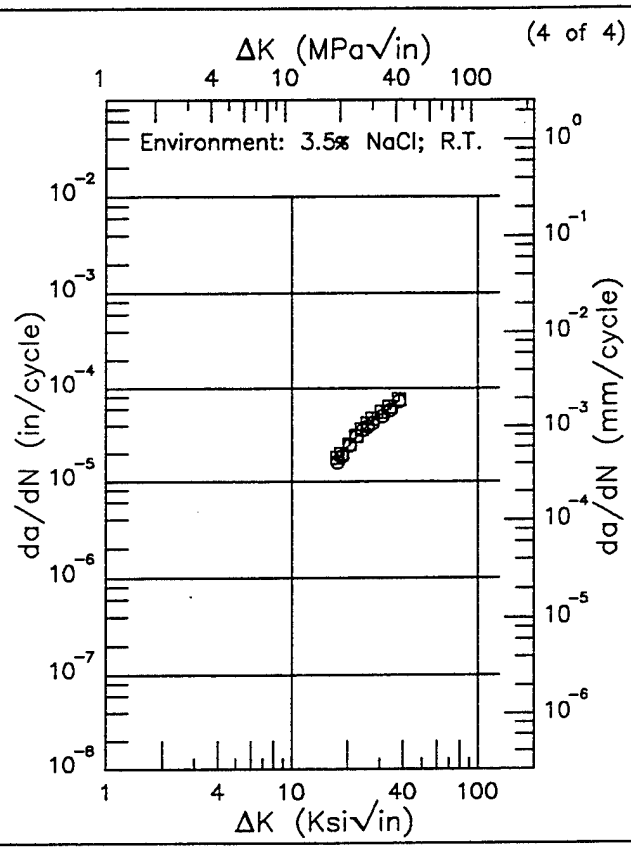
Figure 6.11.3.1.2

Ti–5Al–2.5Sn E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.1
Frequency: 50 Hz

Yield Strength: 122.3 ksi
Ult. Strength: 133.9 ksi
Specimen Thk: 0.083 – 0.084 in.
Specimen Width: 2.754 – 2.756 in.
Ref: 88911



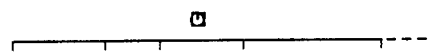


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.62 (min)	7.49
20.	11.8
25.	20.4
30.	31.1
35.	42.4
40.	52.7
42.00 (max)	56.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.57 (min)	16.3
20.	23.5
25.	37.5
30.	50.5
35.	64.2
38.00 (max)	73.6

RMS % Error 7.49

Life Prediction Ratio Summary



RMS % Error 4.55

Life Prediction Ratio Summary

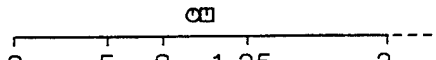


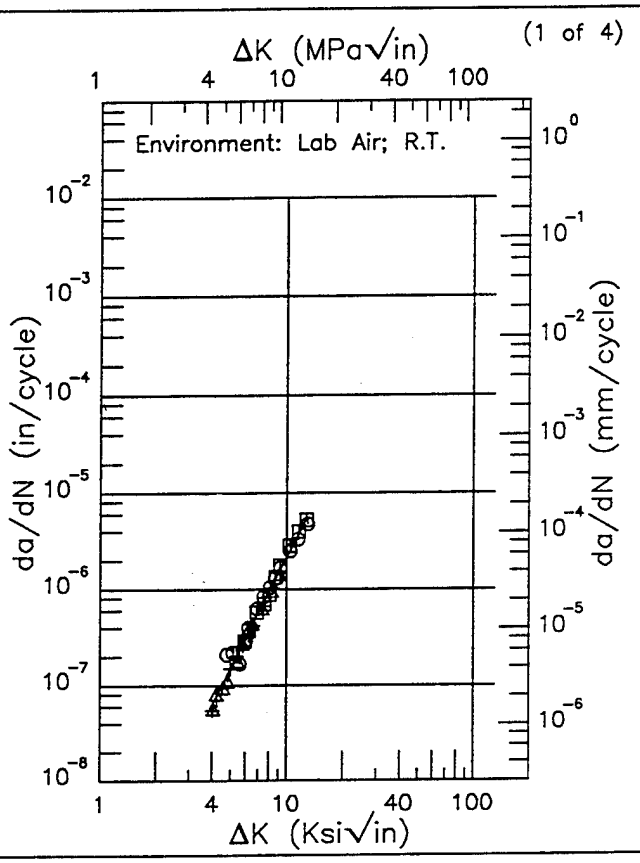
Figure 6.11.3.1.2 (Concluded)

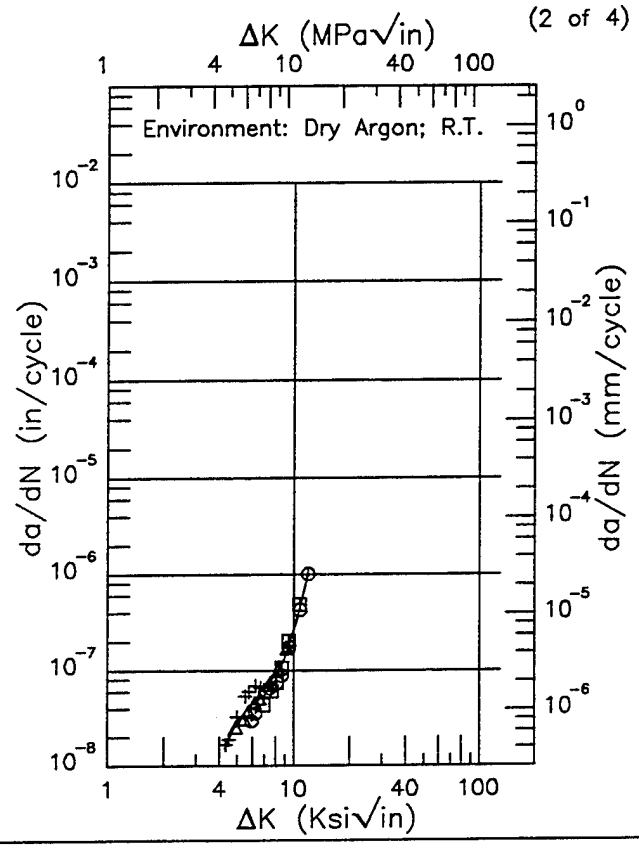
Ti–5Al–2.5Sn

E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.67
Frequency: 55 – 58.3 Hz

Yield Strength: 122.3 ksi
Ult. Strength: 133.9 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.752 – 2.756 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.99 (min)	0.0604
4.	0.0610
5.	0.151
6.	0.310
7.	0.563
8.	0.937
9.	1.46
10.	2.17
12.86 (max)	5.55

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.31 (min)	0.0150
5.	0.0301
6.	0.0443
7.	0.0559
8.	0.0796
9.	0.138
10.	0.269
11.87 (max)	0.999

RMS % Error	Life Prediction Ratio Summary
14.65	0. .5 .8 1.25 2.

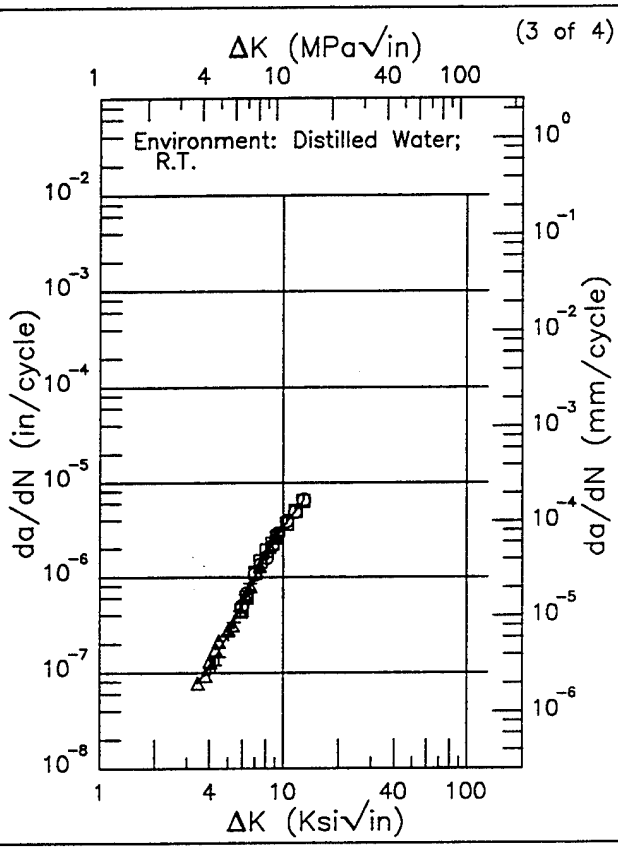
RMS % Error	Life Prediction Ratio Summary
18.52	0. .5 .8 1.25 2.

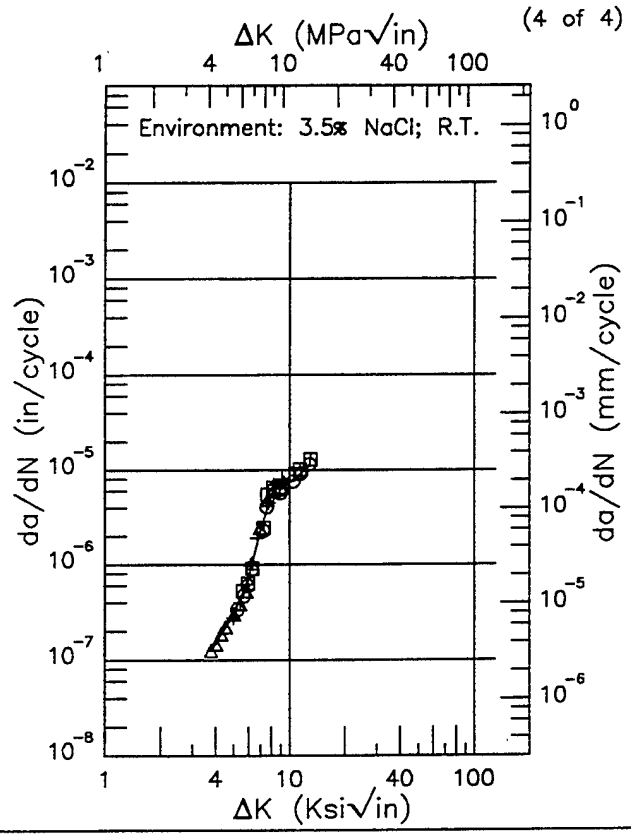
Figure 6.11.3.1.3

Ti–5Al–2.5Sn E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.67
Frequency: 55 – 58.3 Hz

Yield Strength: 122.3 ksi
Ult. Strength: 133.9 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.752 – 2.756 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.44 (min)	0.0777
3.5	0.0804
4.	0.113
5.	0.249
6.	0.530
7.	1.01
8.	1.68
9.	2.49
10.	3.38
12.87 (max)	6.36

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.77 (min)	0.124
4.	0.149
5.	0.295
6.	0.723
7.	2.29
8.	5.45
9.	7.25
10.	7.38
12.93 (max)	11.3

RMS % Error	Life Prediction Ratio Summary
8.05	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
12.68	0. .5 .8 1.25 2.

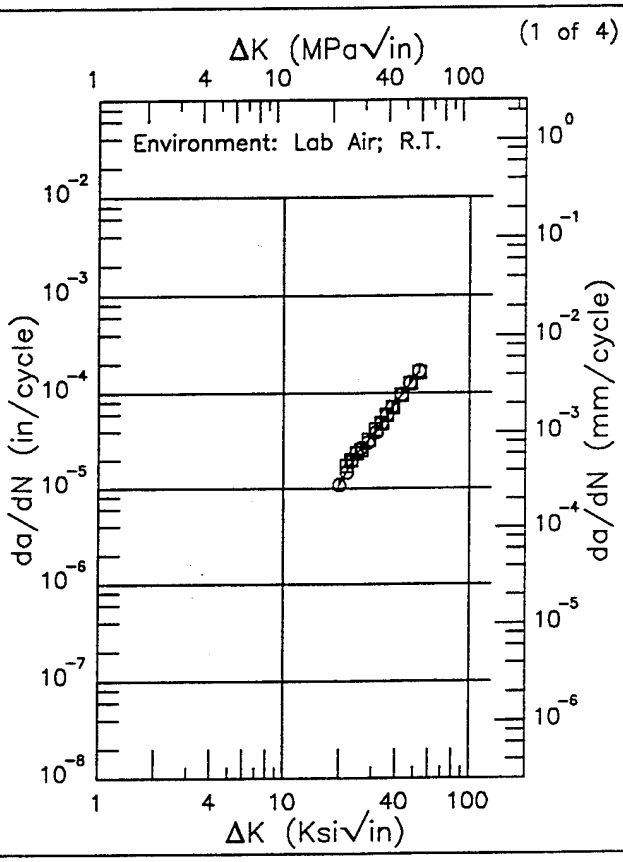
Figure 6.11.3.1.3 (Concluded)

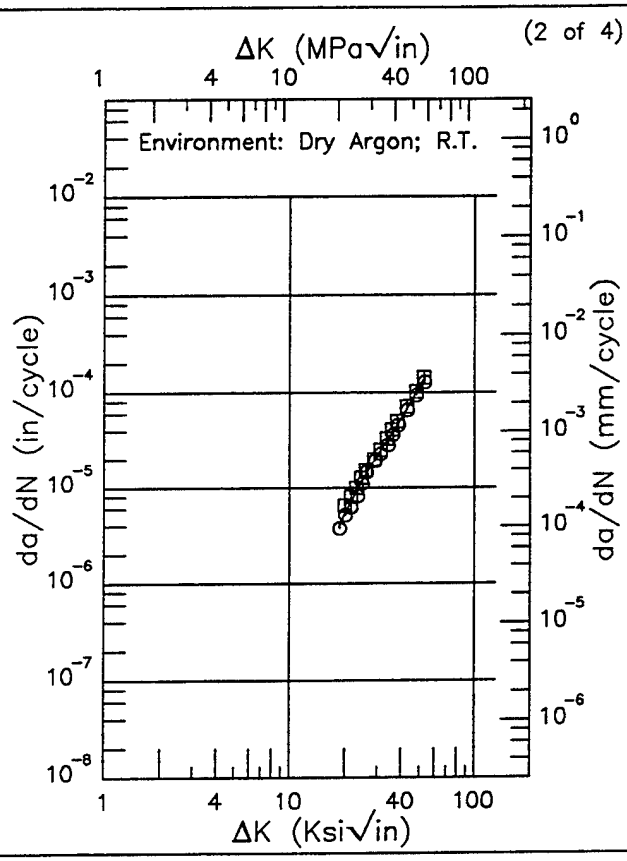
Ti–5Al–2.5Sn

E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength: 125.4 ksi
Ult. Strength: 133.9 – 135.2 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.753 – 2.757 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.82 (min)	10.7
20.	11.2
25.	23.9
30.	35.9
35.	54.0
40.	79.6
50.	140.
53.22 (max)	167.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.62 (min)	3.92
20.	5.38
25.	12.4
30.	22.1
35.	35.3
40.	53.7
50.	114.
53.29 (max)	143.

RMS % Error	Life Prediction Ratio Summary
4.41	0. .5 .8 1.25 2.

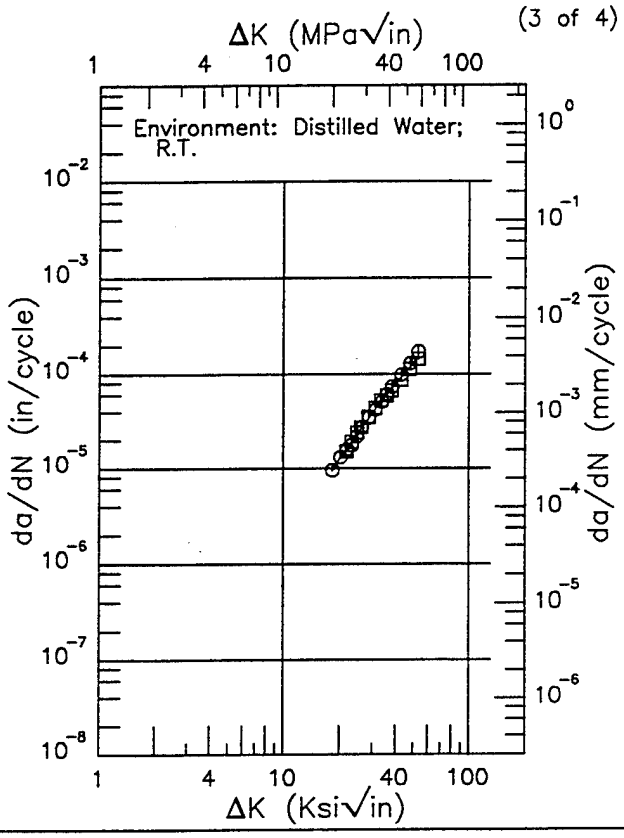
RMS % Error	Life Prediction Ratio Summary
9.16	0. .5 .8 1.25 2.

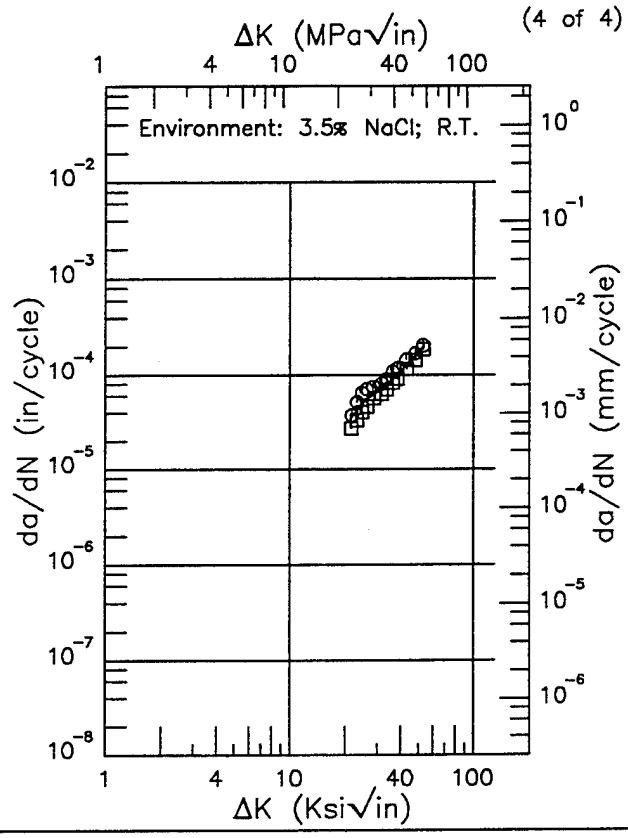
Figure 6.11.3.1.4

Ti–5Al–2.5Sn E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength: 125.4 ksi
Ult. Strength: 133.9 – 135.2 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.753 – 2.757 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.18 (min)	9.47
20.	12.5
25.	23.6
30.	38.6
35.	57.3
40.	79.0
50.	130.
53.08 (max)	148.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.52 (min)	34.7
25.	50.0
30.	68.0
35.	85.7
40.	109.
50.	177.
53.13 (max)	201.

RMS % Error	Life Prediction Ratio Summary
5.01	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.36	0. .5 .8 1.25 2.

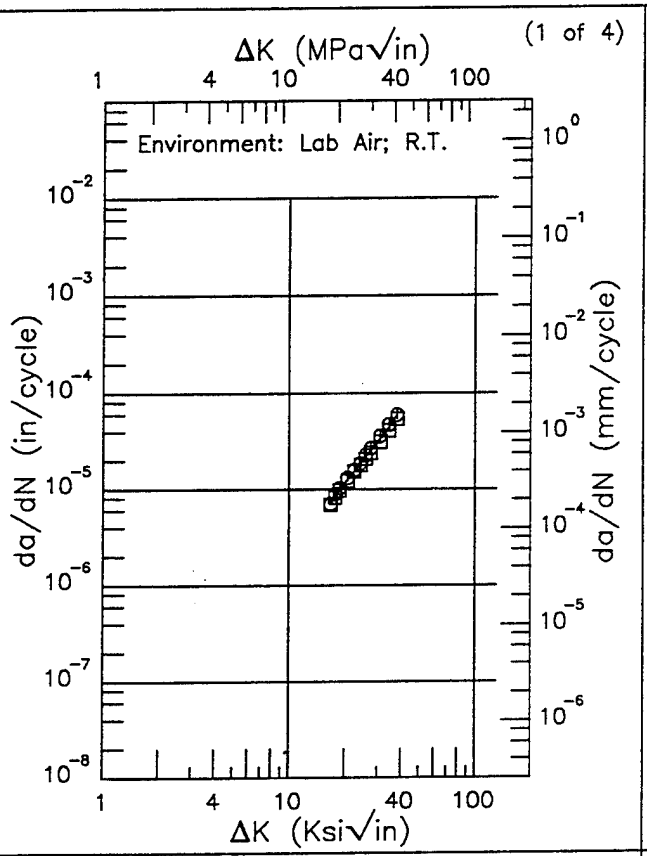
Figure 6.11.3.1.4 (Concluded)

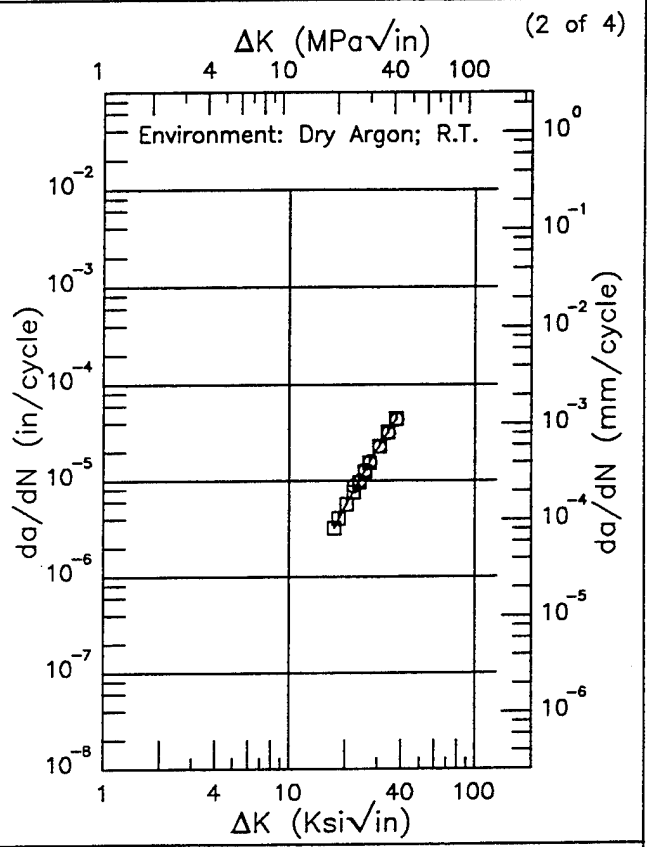
Ti–5Al–2.5Sn

E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Frequency: 50 – 53.3 Hz

Yield Strength: 125.4 ksi
Ult. Strength: 133.9 – 135.2 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.755 – 2.756 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.63 (min)	7.03
20.	11.8
25.	20.2
30.	31.1
35.	46.5
38.10 (max)	59.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.46 (min)	3.20
20.	5.37
25.	11.7
30.	21.2
35.	34.7
37.87 (max)	44.6

RMS % Error	Life Prediction Ratio Summary
4.83	0. .5 .8 1.25 2.

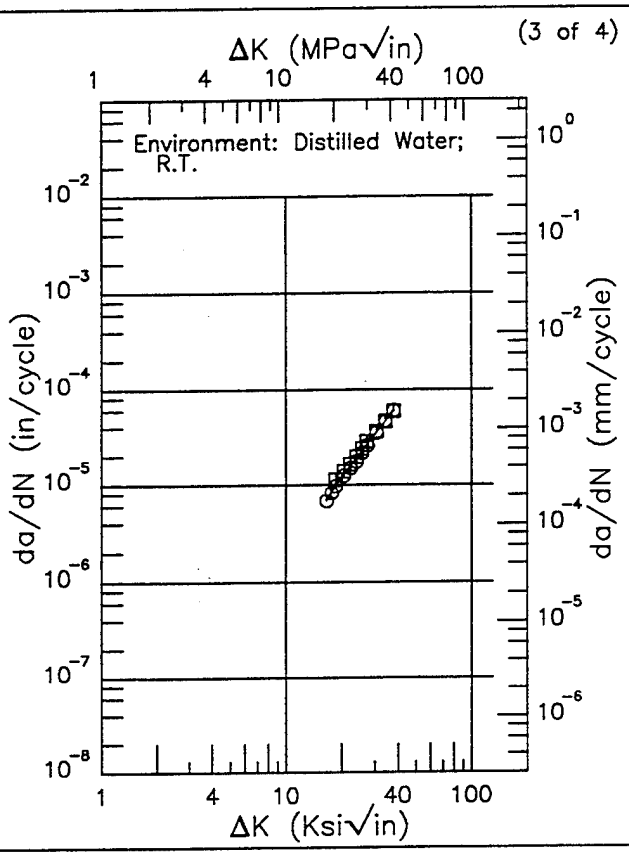
RMS % Error	Life Prediction Ratio Summary
3.70	0. .5 .8 1.25 2.

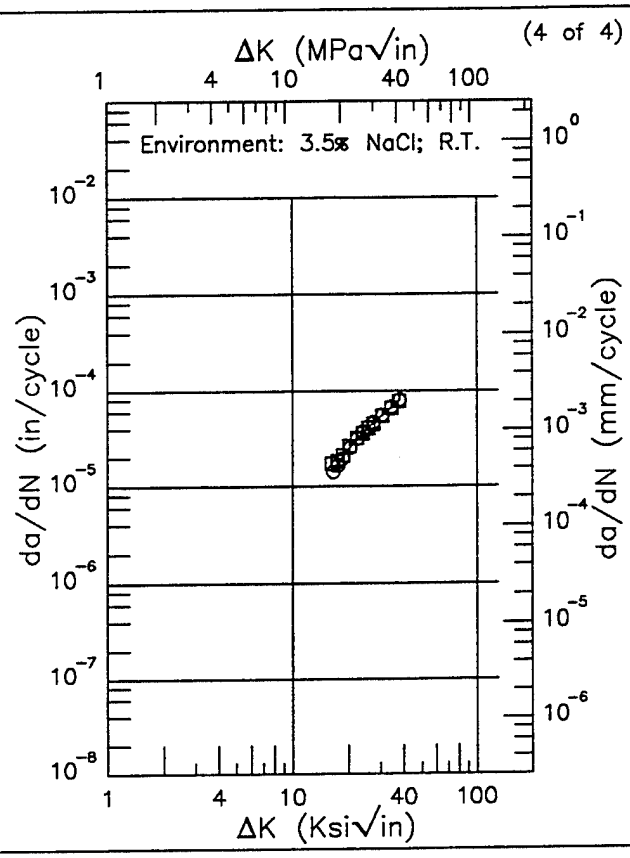
Figure 6.11.3.1.5

Ti–5Al–2.5Sn E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Frequency: 50 – 53.3 Hz

Yield Strength: 125.4 ksi
Ult. Strength: 133.9 – 135.2 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.755 – 2.756 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.57 (min)	7.01
20.	12.0
25.	21.3
30.	33.4
35.	49.2
37.79 (max)	59.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.28 (min)	14.2
20.	24.4
25.	39.3
30.	53.4
35.	69.6
37.84 (max)	79.0

RMS % Error	Life Prediction Ratio Summary
5.76	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
5.01	0. .5 .8 1.25 2.

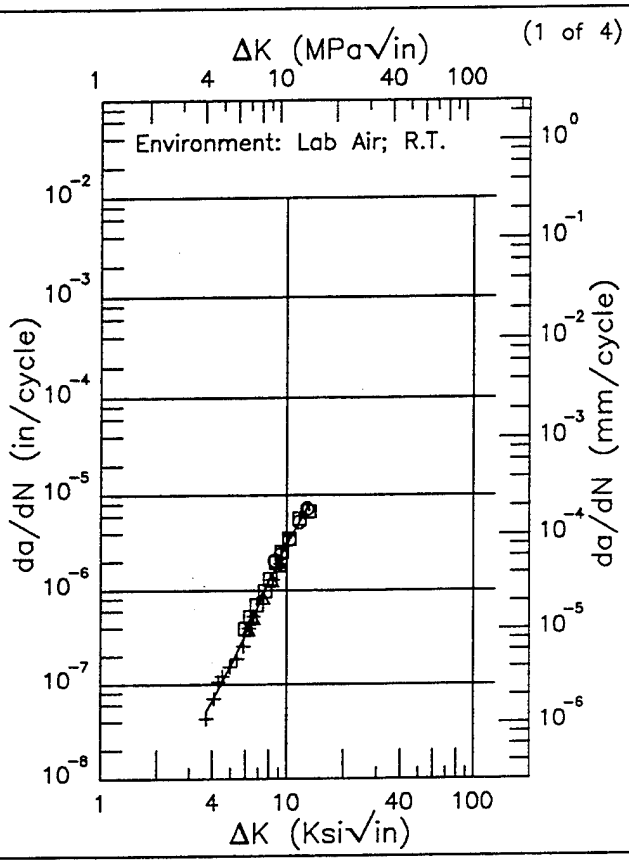
Figure 6.11.3.1.5 (Concluded)

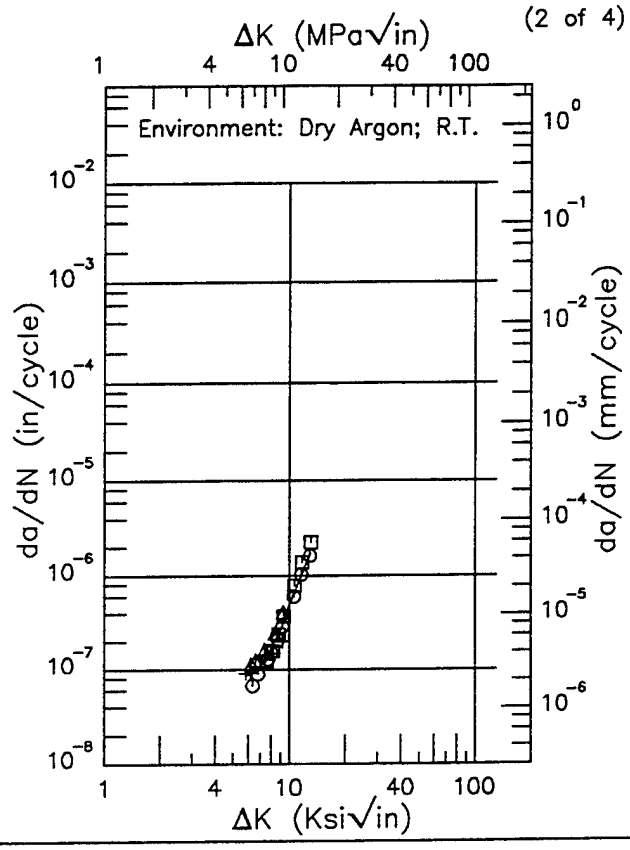
Ti–5Al–2.5Sn

E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.67
Frequency: 54.2 – 58.3 Hz

Yield Strength: 125.4 ksi
Ult. Strength: 133.9 – 135.2 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.753 – 2.757 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.69 (min)	0.0501
4.	0.0662
5.	0.158
6.	0.347
7.	0.685
8.	1.23
9.	2.02
10.	3.08
13.	7.57
13.07 (max)	7.68

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.83 (min)	0.0860
6.	0.0875
7.	0.110
8.	0.163
9.	0.271
10.	0.490
13.	1.73
13.02 (max)	1.73

RMS % Error	Life Prediction Ratio Summary
11.37	0. .5 .8 1.25 2.

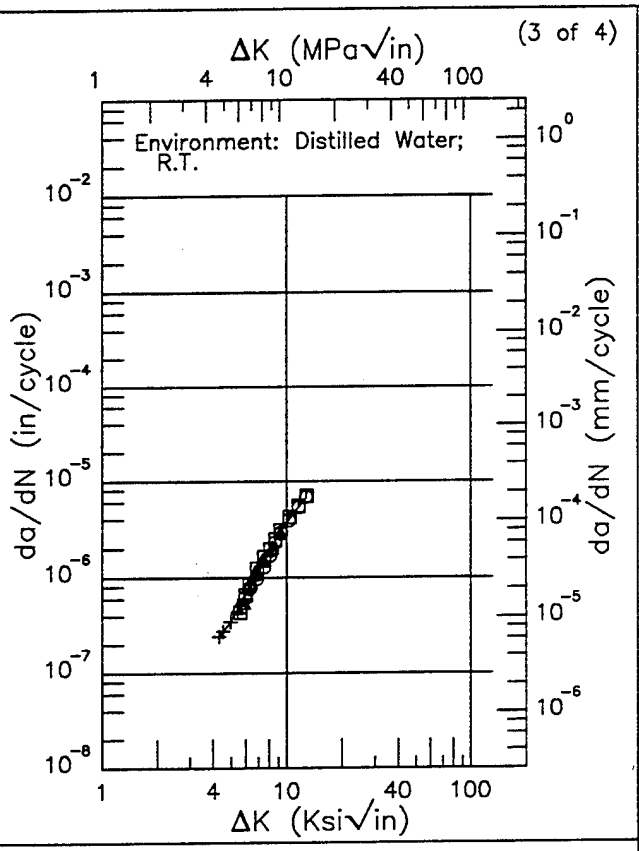
RMS % Error	Life Prediction Ratio Summary
18.25	0. .5 .8 1.25 2.

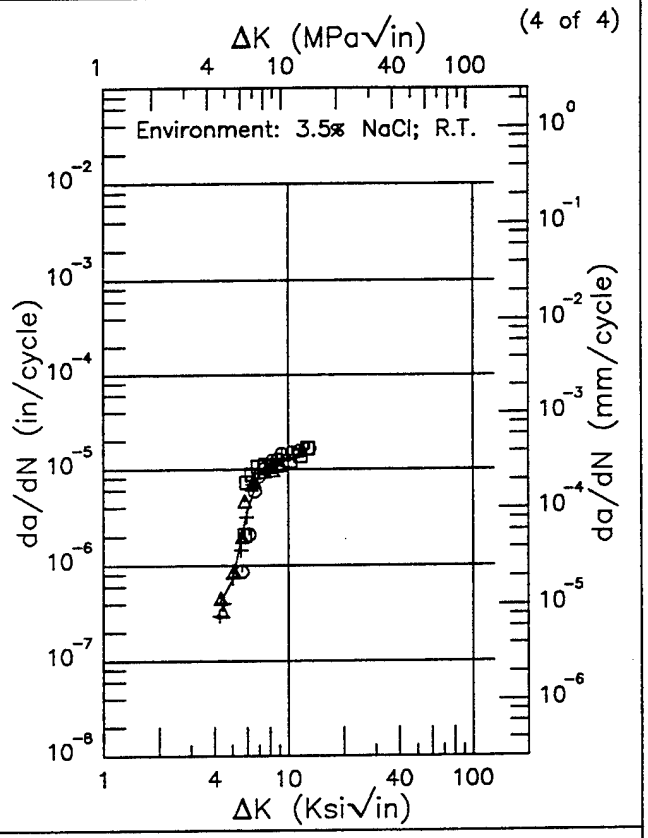
Figure 6.11.3.1.6

Ti–5Al–2.5Sn E

Condition/Ht: ANNEALED
Form: 0.08 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.67
Frequency: 54.2 – 58.3 Hz

Yield Strength: 125.4 ksi
Ult. Strength: 133.9 – 135.2 ksi
Specimen Thk: 0.083 – 0.085 in.
Specimen Width: 2.753 – 2.757 in.
Ref: 88911





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.28 (min)	0.237
5.	0.362
6.	0.657
7.	1.13
8.	1.81
9.	2.70
10.	3.74
12.74 (max)	6.70

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.23 (min)	0.395
5.	0.698
6.	3.65
7.	9.00
8.	11.0
9.	11.6
10.	12.5
12.91 (max)	16.4

RMS % Error	Life Prediction Ratio Summary
7.18	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
30.21	0. .5 .8 1.25 2.

Figure 6.11.3.1.6 (Concluded)

TABLE 6.12.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-2-2-2 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ST	PLATE	0.1	1			2.08	48.4	526.59	
		0.1	20		0.3	4.67	31.94		
STA	PLATE	0.1	1				75.53		
		0.1	20		0.46	6.14	16.94		

TABLE 6.12.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-2-2-2 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.6	6.0	10.0	20.0	50.0	100.0
ST	PLATE	0.1	1			2.36	13.56	285.45	
		0.1	20			1.45	11.42	104.74	
STA	PLATE	0.1	1			1.93	17.04	418.61	
		0.1	20		0.17	2.34	13.68		

TABLE 6.12.2.1

TITANIUM Ti-6Al-2Sn-2Zr-2Mo-2Cr-0.25Si K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1740F 1 HR AC	Plate	0.62	R.T.	L-T	148.0	2.000	0.625	CT	1.000	0.45	62.90	61.6	1.6	1974	88186
		0.62			148.0	2.000	0.625	CT	1.000	0.41	59.80			1974	88186
		0.62			148.0	2.000	0.626	CT	1.000	0.44	62.00			1974	88186
STA-1740F 1 HR AC 1000F 8HR AC	Plate	0.62	R.T.	L-T	157.0	2.000	0.625	CT	1.000	0.30	54.30	55.3	1.5	1974	88186
		0.62			157.0	2.000	0.624	CT	1.000	0.33	57.00			1974	88186
		0.62			157.0	2.000	0.625	CT	1.000	0.30	54.70			1974	88186

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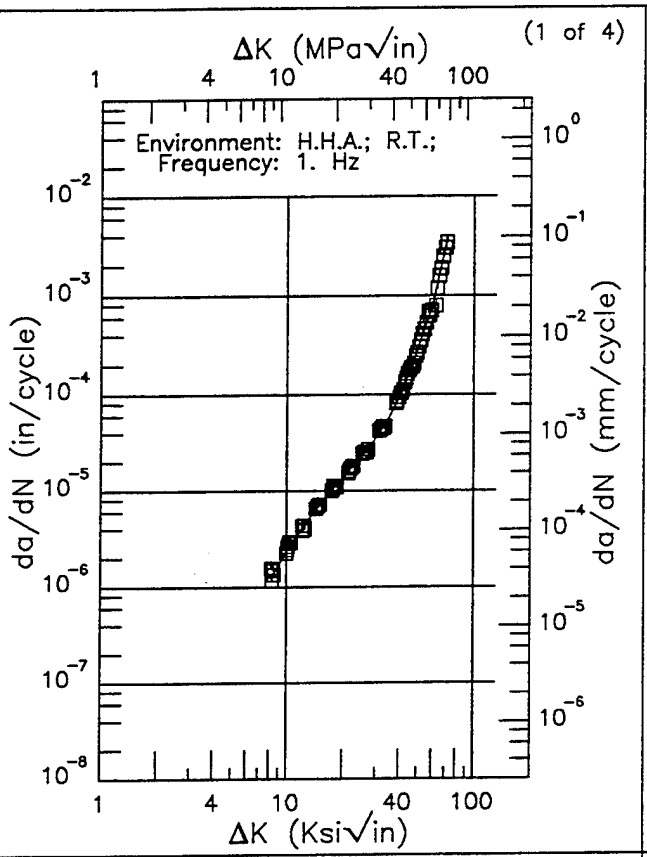
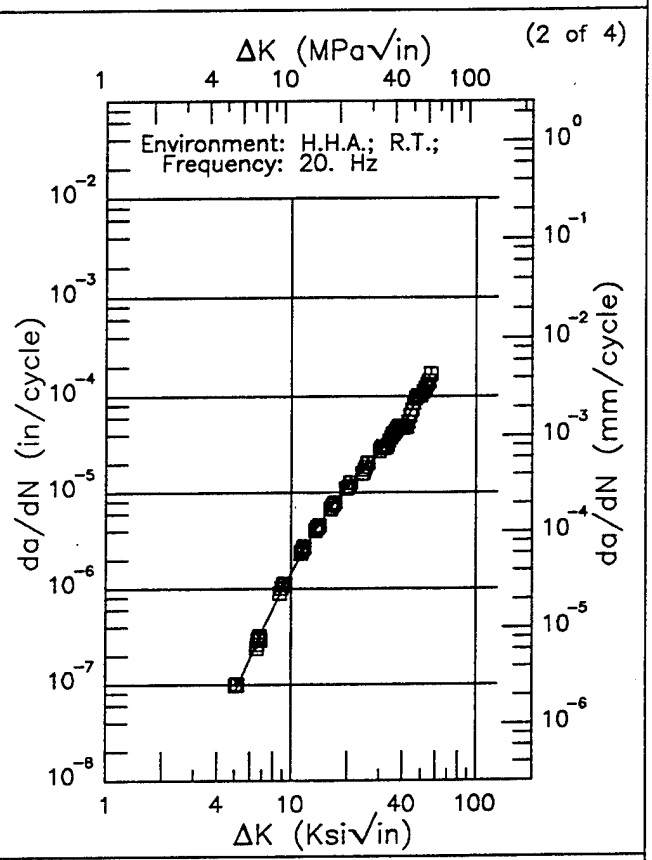
Ti-6-2-2-2-2

EF

Condition/Ht: ST
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L-T
Stress Ratio: 0.1

Yield Strength: 157 ksi
Ult. Strength:
Specimen Thk: 0.151 – 0.152 in.
Specimen Width: 3 in.
Ref: 86844





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.23 (min)	1.23
9.	1.68
10.	2.36
13.	4.93
16.	8.17
20.	13.6
25.	22.5
30.	35.5
35.	57.1
40.	95.5
50.	285.
60.	788.
70.	3037.
71.40 (max)	3918.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.05 (min)	0.0855
6.	0.184
7.	0.355
8.	0.614
9.	0.976
10.	1.45
13.	3.58
16.	6.61
20.	11.4
25.	18.1
30.	26.1
35.	36.6
40.	51.4
50.	105.
56.48 (max)	154.

RMS % Error	Life Prediction Ratio Summary
6.93	0. .5 .8 1.25 2.

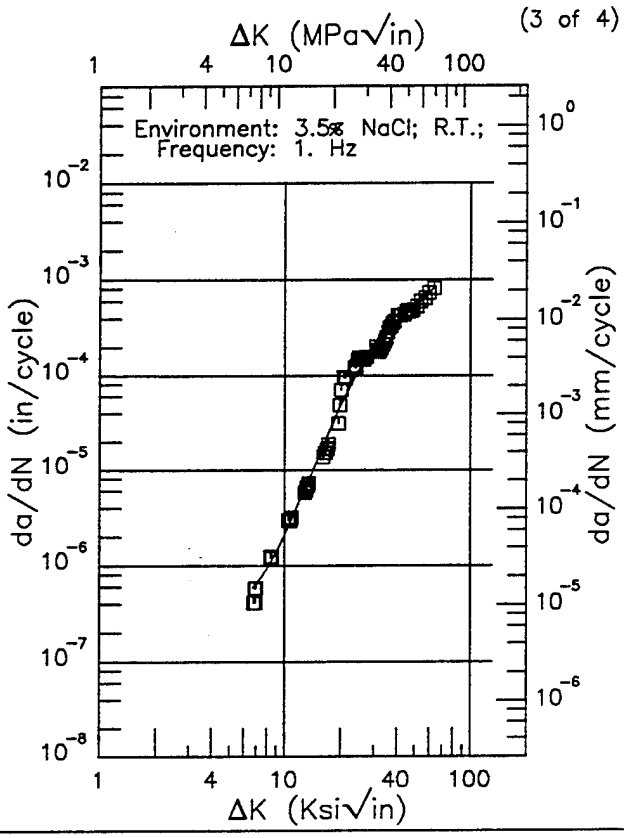
RMS % Error	Life Prediction Ratio Summary
6.62	0. .5 .8 1.25 2.

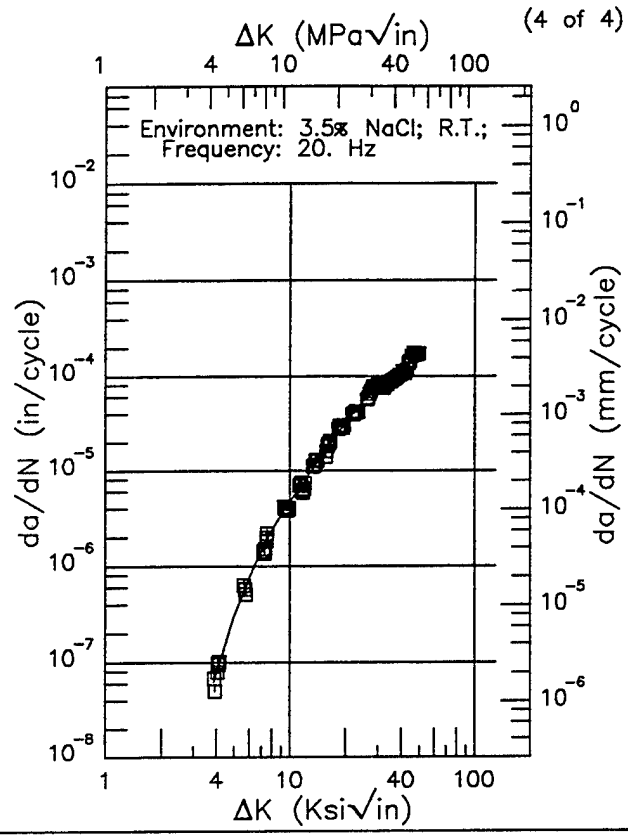
Figure 6.12.3.1.1

Ti-6-2-2-2-2 EF

Condition/Ht: ST
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L-T
Stress Ratio: 0.1

Yield Strength: 157 ksi
Ult. Strength:
Specimen Thk: 0.151 - 0.152 in.
Specimen Width: 3 in.
Ref: 86844





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.77 (min)	0.596
7.	0.642
8.	0.924
9.	1.38
10.	2.08
13.	6.63
16.	17.6
20.	48.4
25.	116.
30.	201.
35.	289.
40.	373.
50.	527.
60.	727.
63.48 (max)	831.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.89 (min)	0.0620
4.	0.0755
5.	0.301
6.	0.749
7.	1.43
8.	2.32
9.	3.41
10.	4.67
13.	9.67
16.	17.1
20.	31.9
25.	54.5
30.	73.6
35.	89.6
40.	109.
49.43 (max)	193.

RMS % Error	Life Prediction Ratio Summary
21.60	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.15	0. .5 .8 1.25 2.

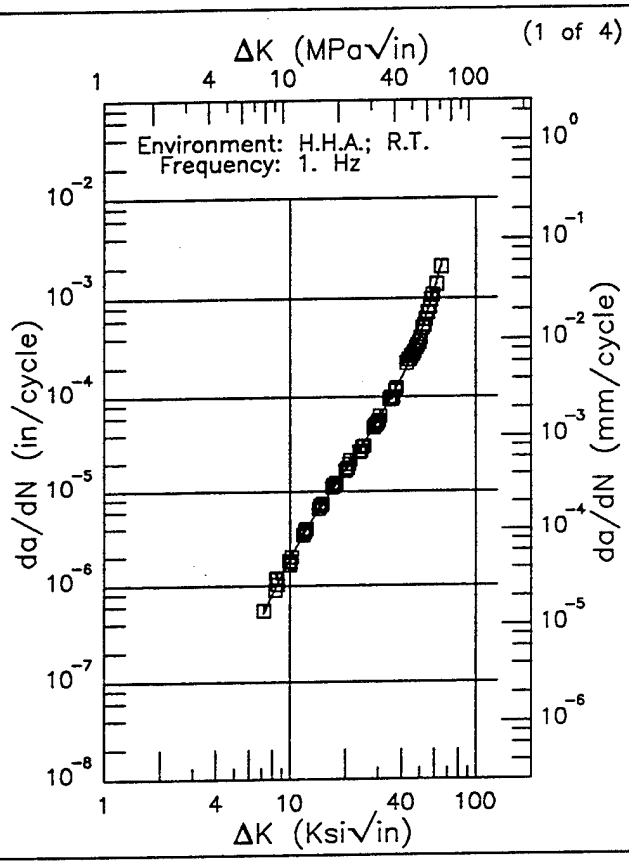
Figure 6.12.3.1.1 (Concluded)

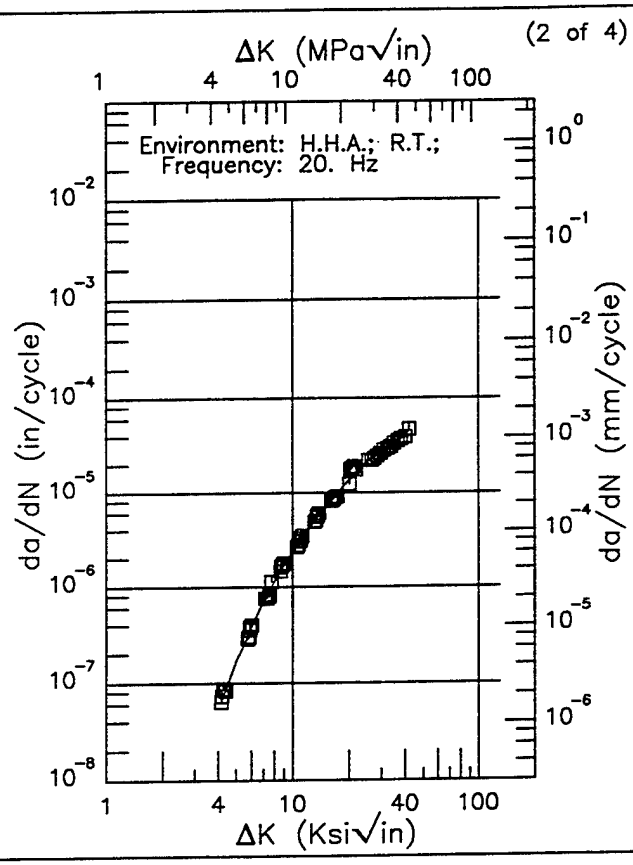
Ti-6-2-2-2-2

EF

Condition/Ht: STA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L-T
Stress Ratio: 0.1

Yield Strength: 157 ksi
Ult. Strength:
Specimen Thk: 0.143 – 0.147 in.
Specimen Width: 3 in.
Ref: 86844





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.18 (min)	0.509
8.	0.813
9.	1.30
10.	1.93
13.	4.69
16.	8.86
20.	17.0
25.	32.8
30.	57.7
35.	96.7
40.	159.
50.	419.
60.	1188.
64.83 (max)	2082.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.13 (min)	0.0622
5.	0.166
6.	0.377
7.	0.700
8.	1.14
9.	1.68
10.	2.34
13.	4.87
16.	8.19
20.	13.7
25.	21.1
30.	27.3
35.	32.4
40.	40.3
41.87 (max)	44.9

RMS % Error	Life Prediction Ratio Summary
6.11	0. .5 .8 1.25 2.

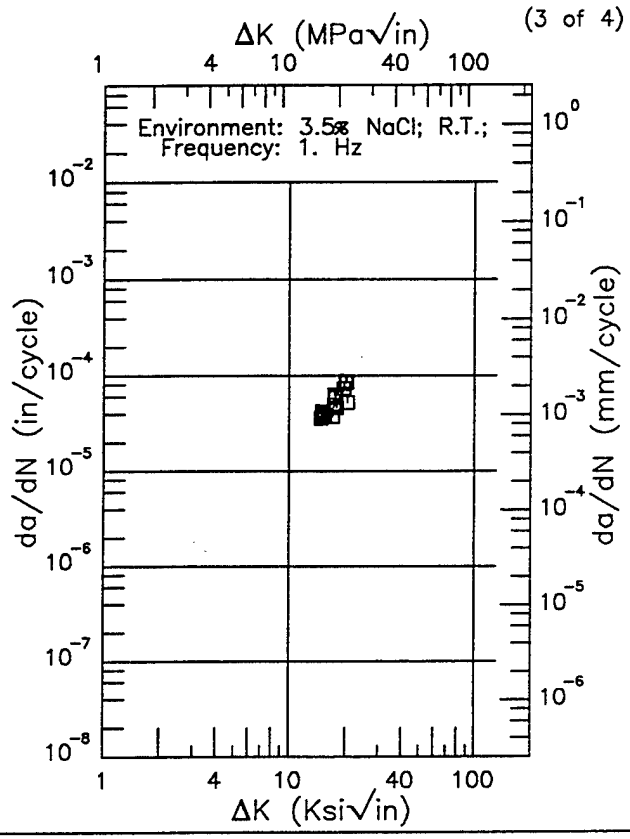
RMS % Error	Life Prediction Ratio Summary
8.28	0. .5 .8 1.25 2.

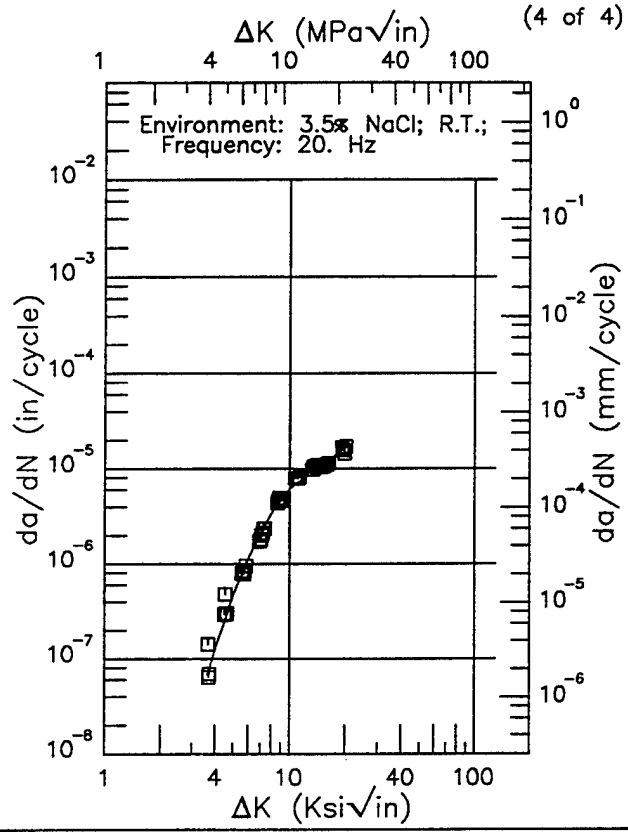
Figure 6.12.3.1.2

Ti-6-2-2-2-2 EF

Condition/Ht: STA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L-T
Stress Ratio: 0.1

Yield Strength: 157 ksi
Ult. Strength:
Specimen Thk: 0.143 - 0.147 in.
Specimen Width: 3 in.
Ref: 86844





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.74 (min)	38.5
16.	37.7
20.	75.5
20.37 (max)	69.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.64 (min)	0.0686
4.	0.126
5.	0.456
6.	1.11
7.	2.10
8.	3.35
9.	4.74
10.	6.14
13.	9.43
16.	11.8
20.	16.9
20.05 (max)	17.0

RMS % Error	Life Prediction Ratio Summary
13.97	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
20.69	0. .5 .8 1.25 2.

Figure 6.12.3.1.2 (Concluded)

TABLE 6.13.1.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-4-2 AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
1790F 1HR AC 1100F 8HR AC	FORGING	0.1	0.16				10		
		0.5	0.16			2.3			

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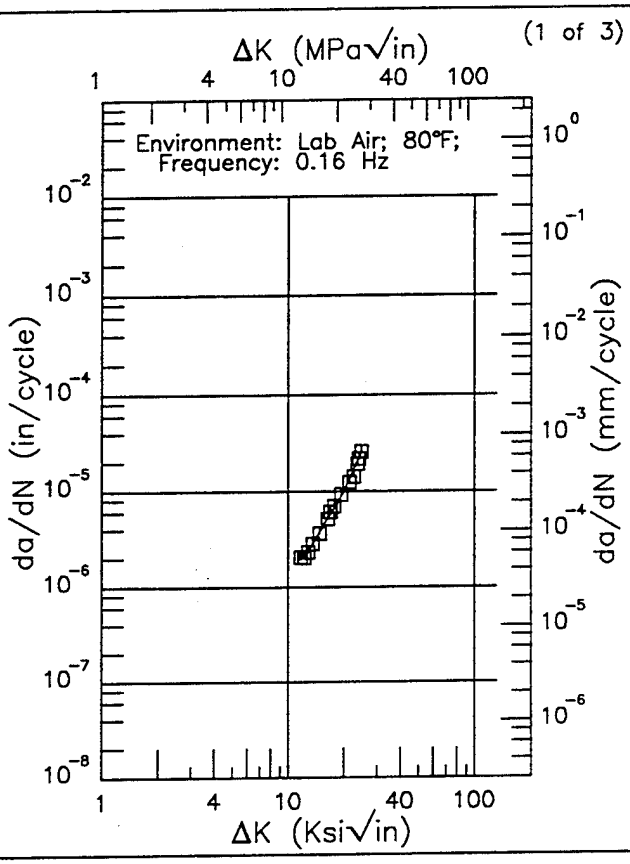
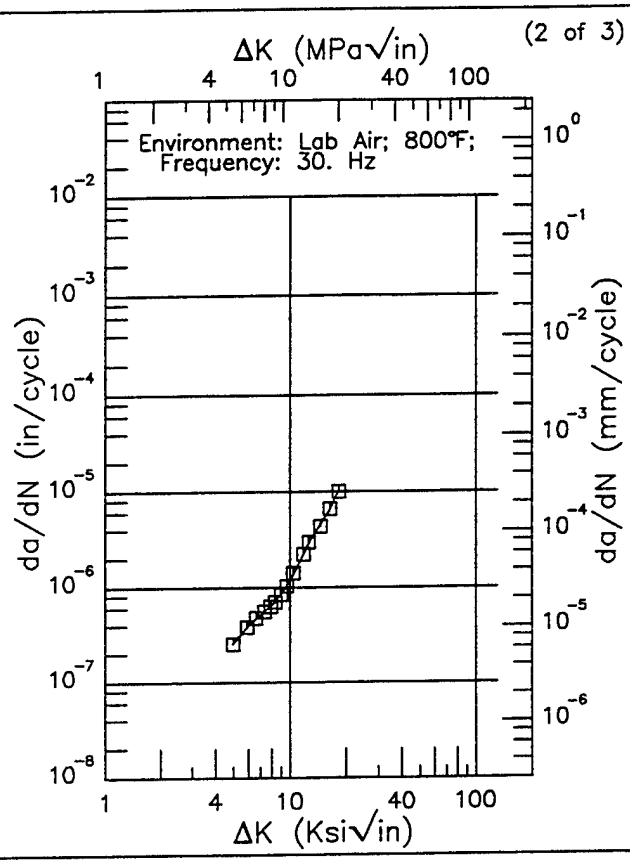
Ti-6-2-4-2

EF

Condition/Ht: 1790F 1HR AC 1100F 8HR AC
Form: 2 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Stress Ratio: 0.1

Yield Strength: 139.4 – 140.9 ksi
Ult. Strength: 151.6 – 152.3 ksi
Specimen Thk: 0.073 – 0.083 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.61 (min)	1.98
13.	2.42
16.	4.96
20.	10.00
24.68 (max)	25.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.95 (min)	0.254
5.	0.262
6.	0.397
7.	0.515
8.	0.653
9.	0.858
10.	1.19
13.	3.20
16.	5.89
18.28 (max)	10.1

RMS % Error	Life Prediction Ratio Summary
6.12	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
2.06	0. .5 .8 1.25 2.

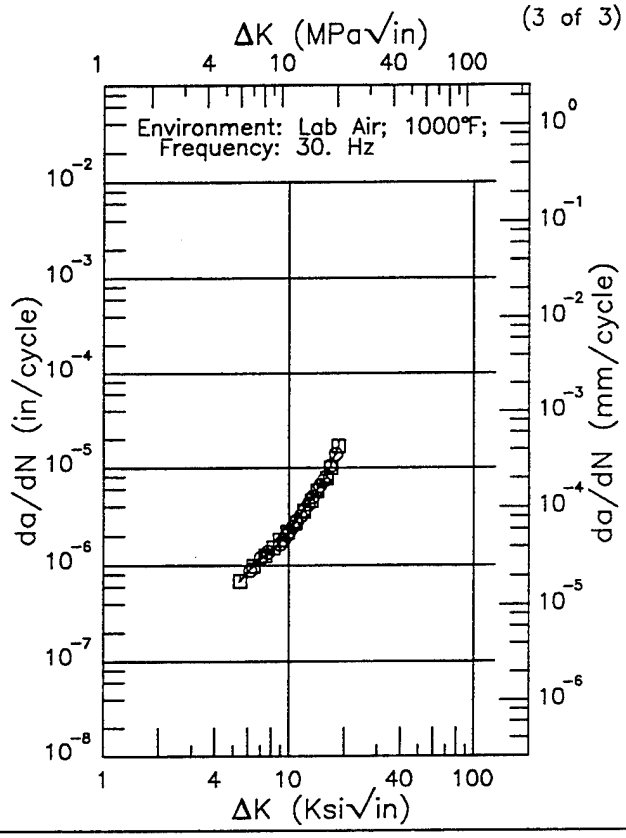
Figure 6.13.3.1.1

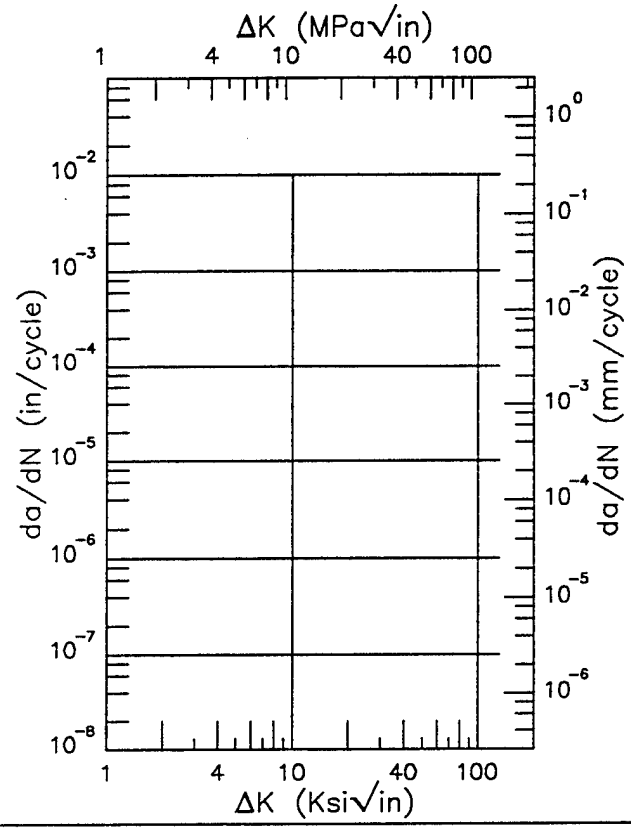
Ti-6-2-4-2 EF

Condition/Ht: 1790F 1HR AC 1100F 8HR AC
Form: 2 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Stress Ratio: 0.1

Yield Strength: 139.4 - 140.9 ksi
Ult. Strength: 151.6 - 152.3 ksi
Specimen Thk: 0.073 - 0.083 in.
Specimen Width: 1.75 in.
Ref: PW002

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.44 (min)	0.680
6.	0.858
7.	1.14
8.	1.42
9.	1.75
10.	2.19
13.	4.50
16.	8.31
18.45 (max)	16.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.85	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

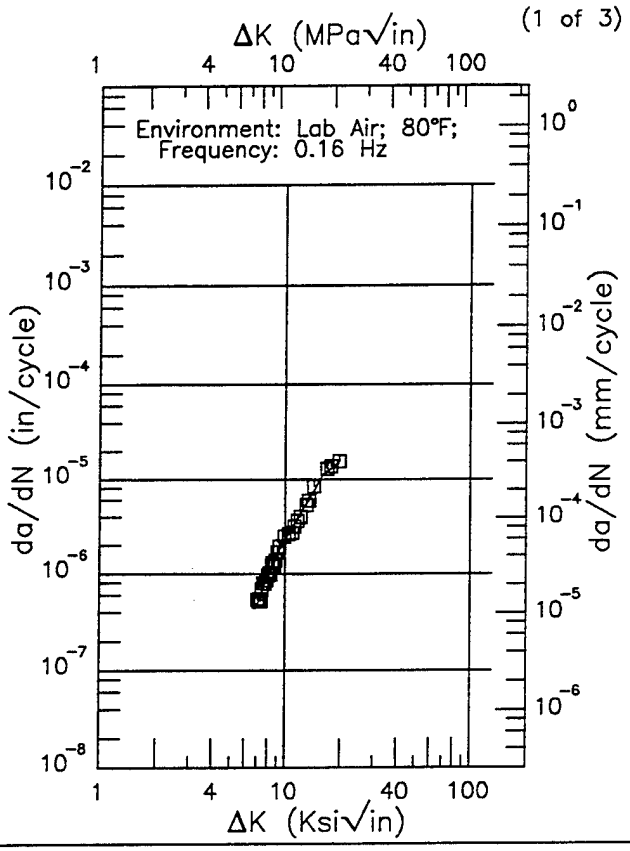
Figure 6.13.3.1.1 (Concluded)

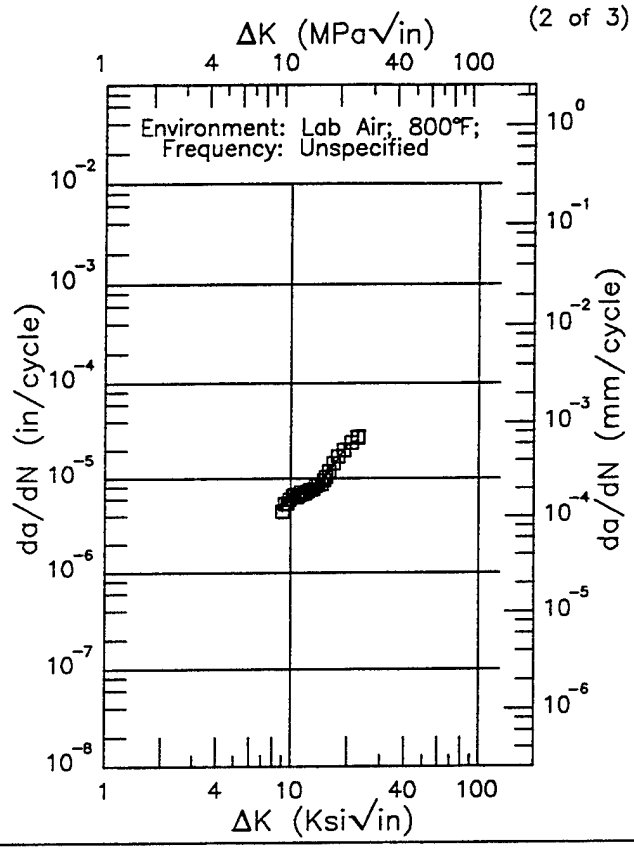
Ti-6-2-4-2

EF

Condition/Ht: 1790F 1HR AC 1100F 8HR AC
Form: 2 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Stress Ratio: 0.5

Yield Strength: 139.4 – 140.9 ksi
Ult. Strength: 151.6 – 152.3 ksi
Specimen Thk: 0.074 – 0.082 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.05 (min)	0.466
8.	0.951
9.	1.58
10.	2.30
13.	5.37
16.	11.4
19.52 (max)	14.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.97 (min)	4.87
9.	4.90
10.	5.88
13.	7.76
16.	11.4
20.	22.6
22.81 (max)	25.6

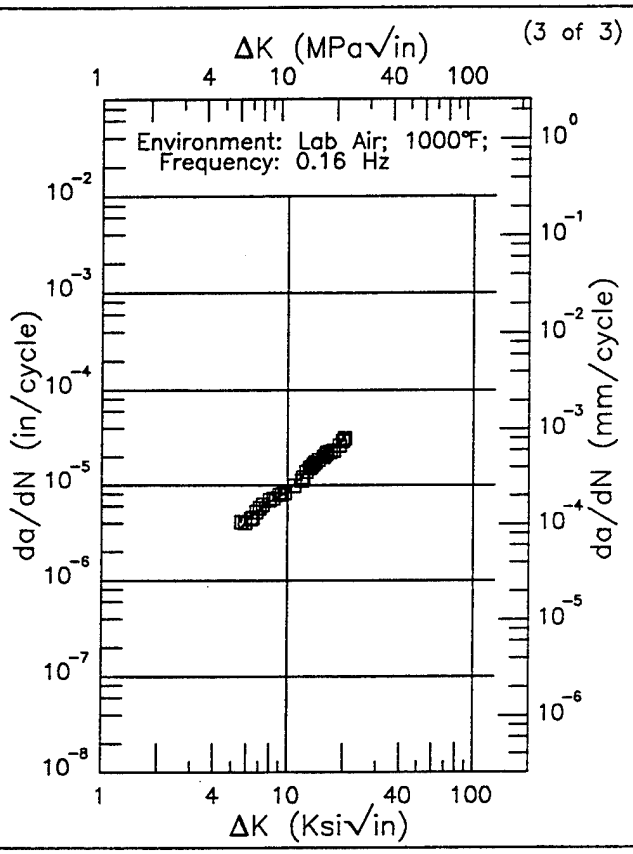
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
7.60	0. .5 .8 1.25 2.	4.99	0. .5 .8 1.25 2.

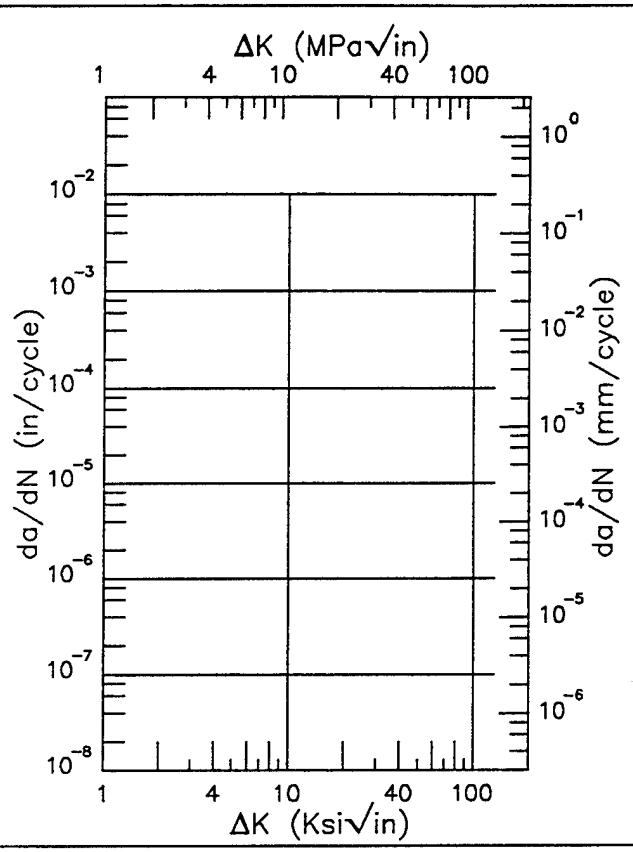
Figure 6.13.3.1.2

Ti-6-2-4-2 EF

Condition/Ht: 1790F 1HR AC 1100F 8HR AC
Form: 2 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Stress Ratio: 0.5

Yield Strength: 139.4 - 140.9 ksi
Ult. Strength: 151.6 - 152.3 ksi
Specimen Thk: 0.074 - 0.082 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.60 (min)	3.57
6.	4.23
7.	5.58
8.	6.62
9.	7.60
10.	8.74
13.	14.3
16.	20.6
20.	29.7
20.12 (max)	30.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
4.46	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.13.3.1.2 (Concluded)

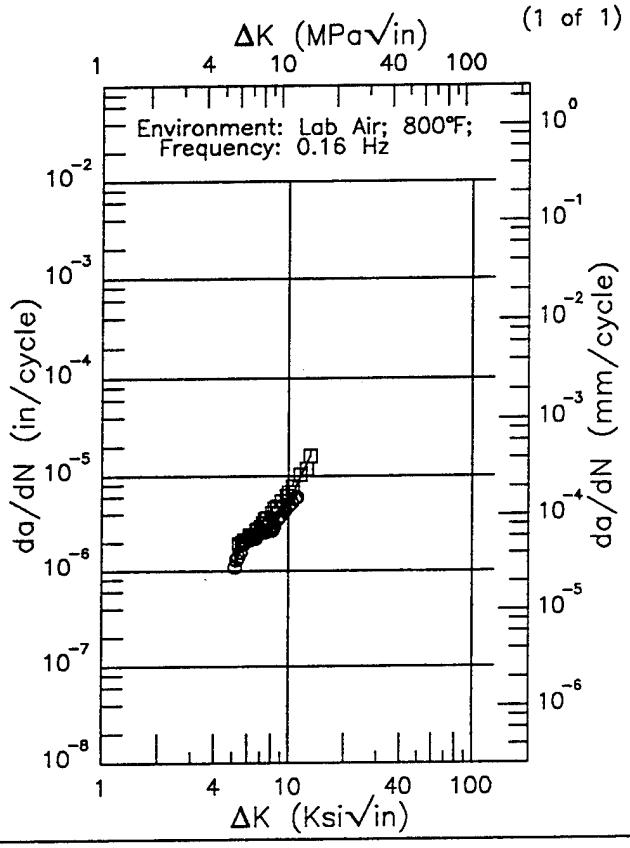
Ti-6-2-4-2

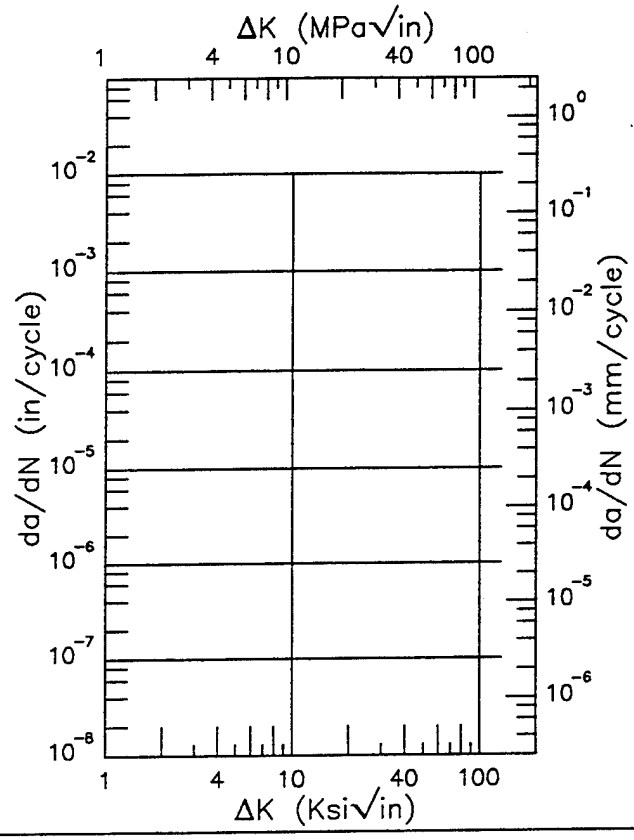
EF

Condition/Ht: 1790F 1HR AC 1100F 8HR AC
Form: 2 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Stress Ratio: 0.7

Yield Strength: 135.5 – 140.9 ksi
Ult. Strength: 148.5 – 152.3 ksi
Specimen Thk: 0.08 – 0.081 in.
Specimen Width: 1.75 in.
Ref: PW002

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.15 (min)	1.36
6.	2.04
7.	2.71
8.	3.36
9.	4.16
10.	5.35
13.	15.5
13.08 (max)	16.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
14.63	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.13.3.1.3

TABLE 6.14.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-4-2 ELI AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEAL 1450F 1HR AC	PLATE	-0.3	9				21.3		
		0.1	9				13.49		
		0.5	9				43.6		

TABLE 6.14.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-4-2 ELI AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Vacuum**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEAL 1450F 1HR AC	PLATE	0.1	9				6.63		

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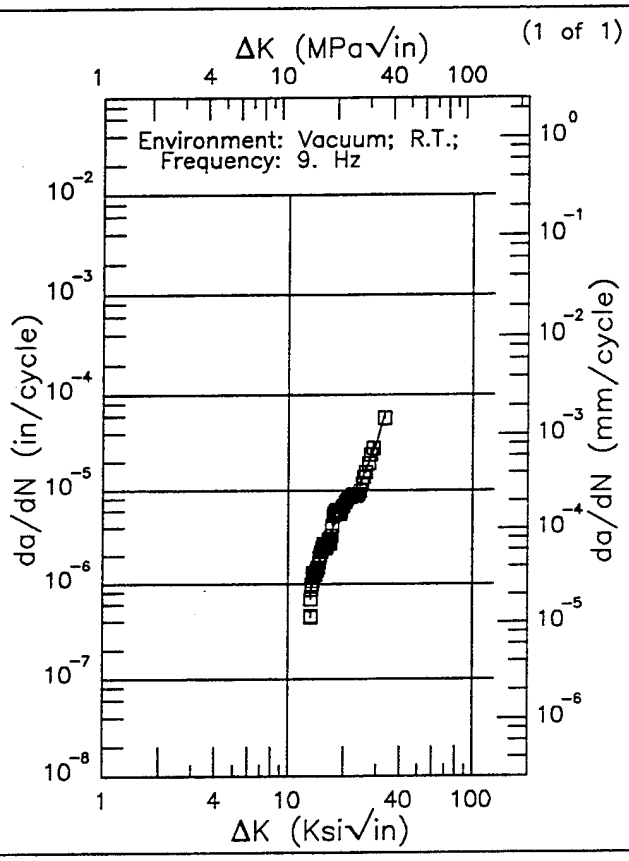
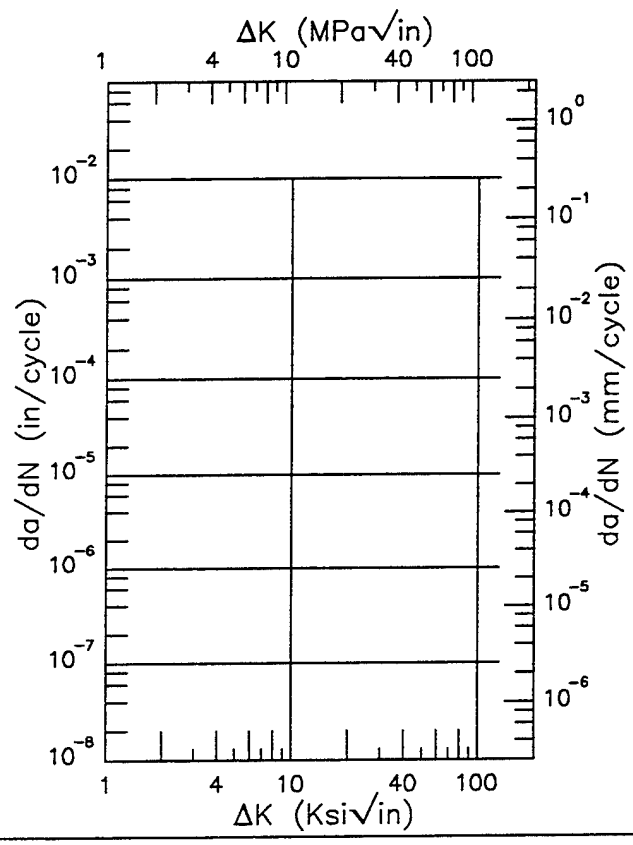
EF Ti-6-2-4-2 ELI

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CT
Orientation: L-T
Stress Ratio: 0.1

Yield Strength: 140 ksi
Ult. Strength: 149 ksi
Specimen Thk: 0.187 in.
Specimen Width: 1.5 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.18 (min)	0.825
16.	2.89
20.	6.63
25.	13.3
30.	31.5
32.99 (max)	60.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 15.85

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.14.3.1.1

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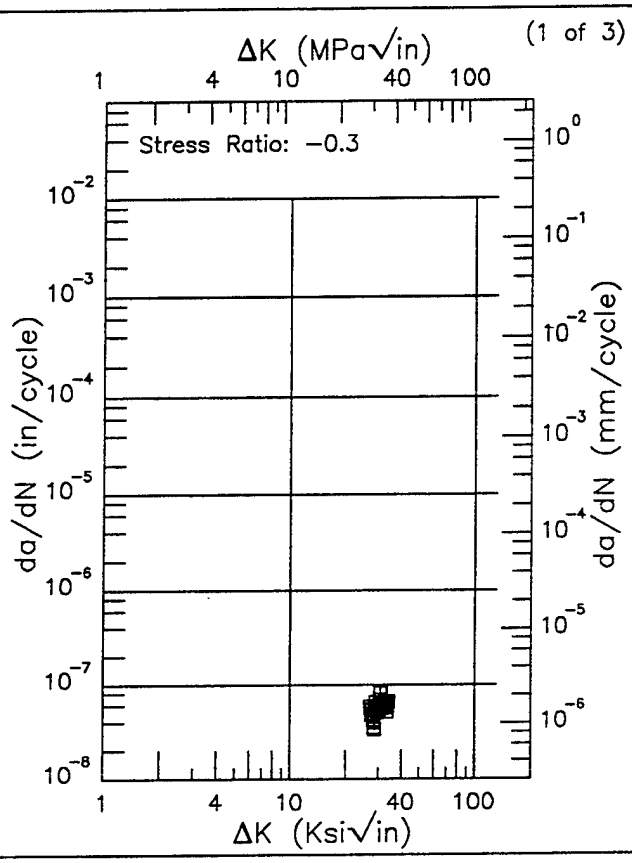
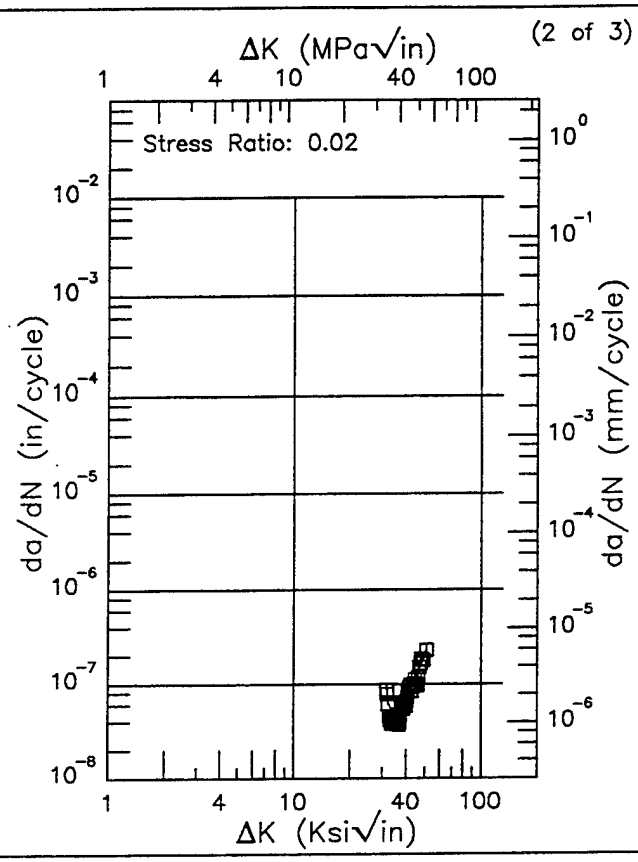
Ti-6-2-4-2 ELI

R

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Frequency: 0. Hz
Environment: LAB AIR;1000°F

Yield Strength: 78 ksi
Ult. Strength: 96 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.03 (min)	0.0599
30.	0.0625
33.72 (max)	0.0637

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
31.31 (min)	0.0740
35.	0.0406
40.	0.0698
50.	0.198
51.13 (max)	0.244

RMS % Error	Life Prediction Ratio Summary
19.14	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
14.31	0. .5 .8 1.25 2.

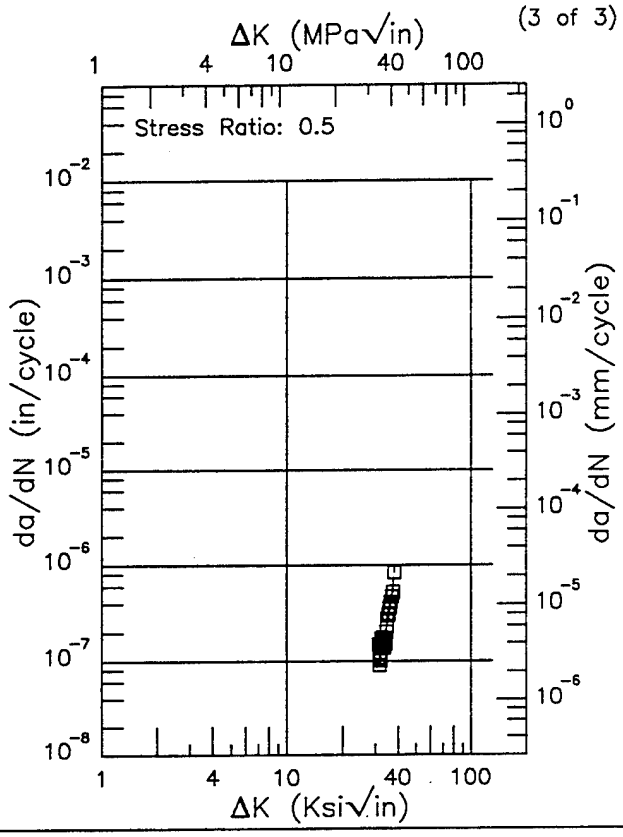
Figure 6.14.3.1.2

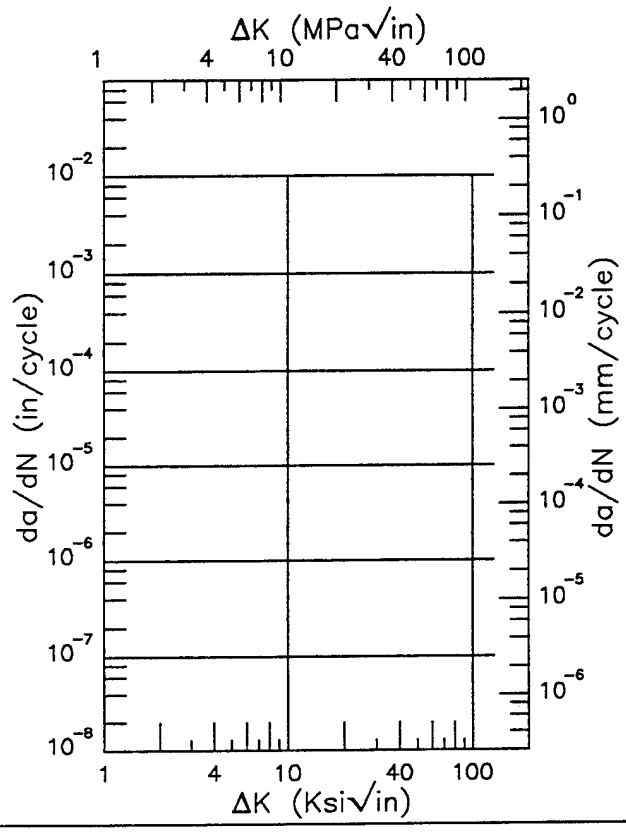
Ti-6-2-4-2 ELI R

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Frequency: 0. Hz
Environment: LAB AIR;1000°F

Yield Strength: 78 ksi
Ult. Strength: 96 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
31.38 (min)	0.114
35.	0.256
38.06 (max)	0.745

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
15.14	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

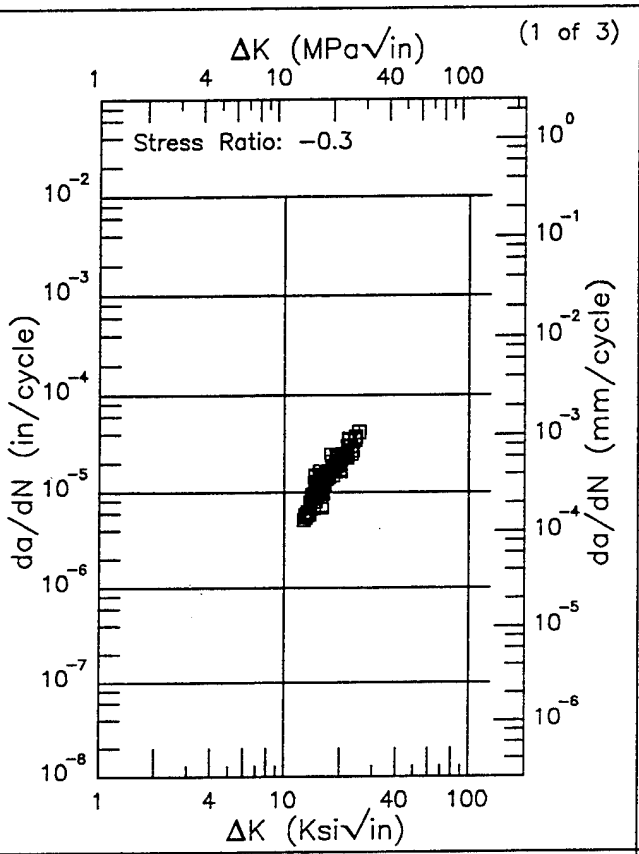
Figure 6.14.3.1.2 (Concluded)

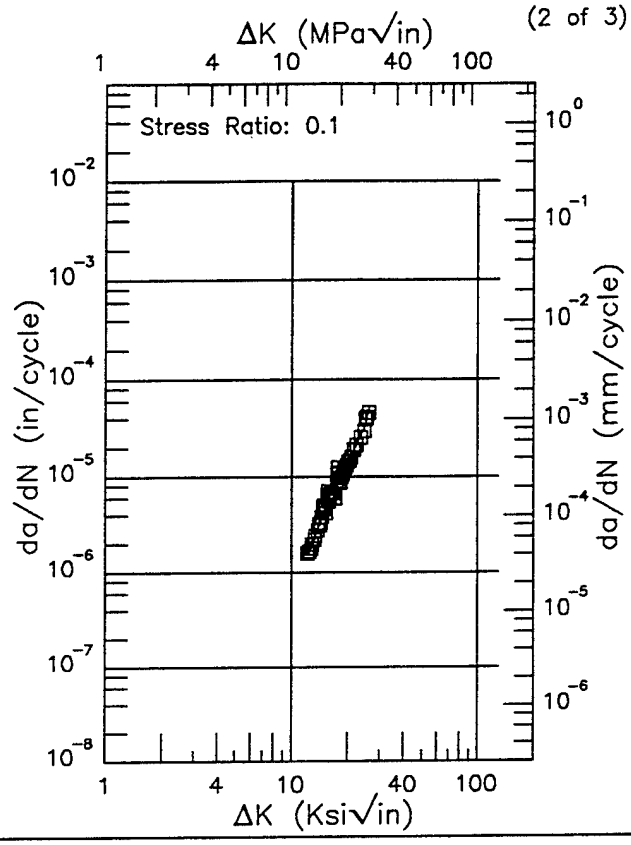
R

Ti-6-2-4-2 ELI

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Frequency: 9 Hz
Environment: LAB AIR; RT

Yield Strength: 140 ksi
Ult. Strength: 149 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.73 (min)	4.93
13.	5.61
16.	13.2
20.	21.3
25.	40.9
25.15 (max)	42.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.17 (min)	1.52
13.	2.05
16.	6.09
20.	13.5
25.	34.2
26.03 (max)	48.3

RMS % Error	Life Prediction Ratio Summary
18.34	0. .5 .8 1.25 2.

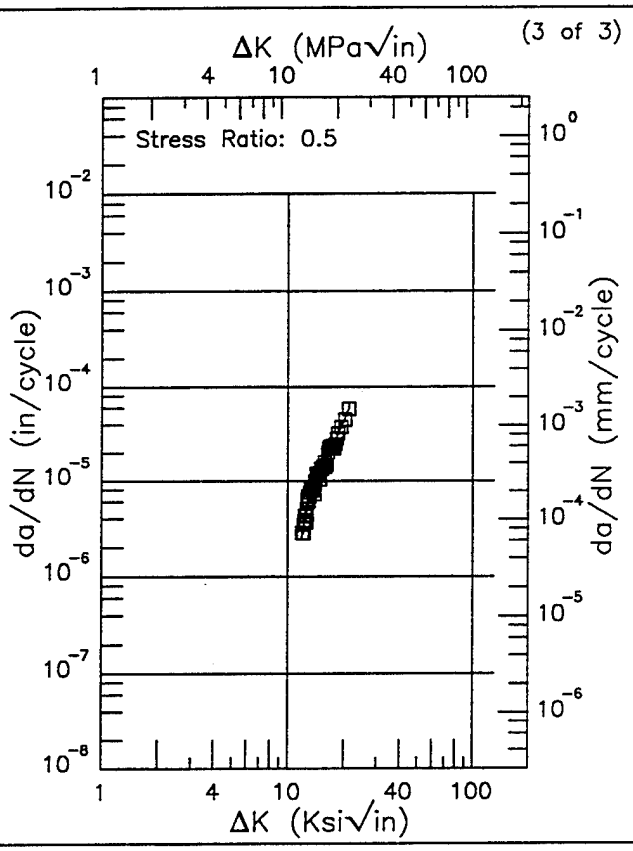
RMS % Error	Life Prediction Ratio Summary
12.45	0. .5 .8 1.25 2.

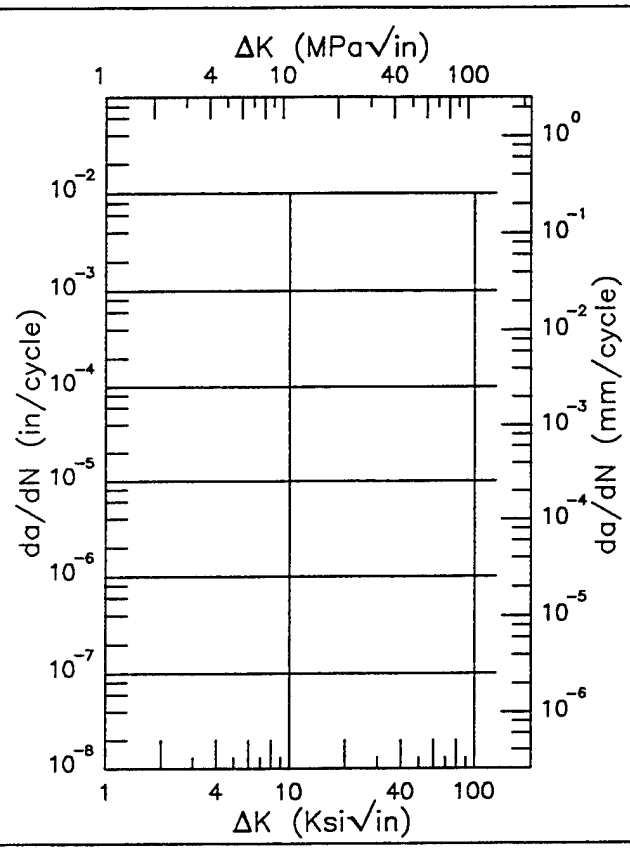
Figure 6.14.3.1.3

Ti-6-2-4-2 ELI R

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Frequency: 9 Hz
Environment: LAB AIR; RT

Yield Strength: 140 ksi
Ult. Strength: 149 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.92 (min)	2.52
13.	6.79
16.	16.9
20.	43.6
21.13 (max)	57.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
10.59	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

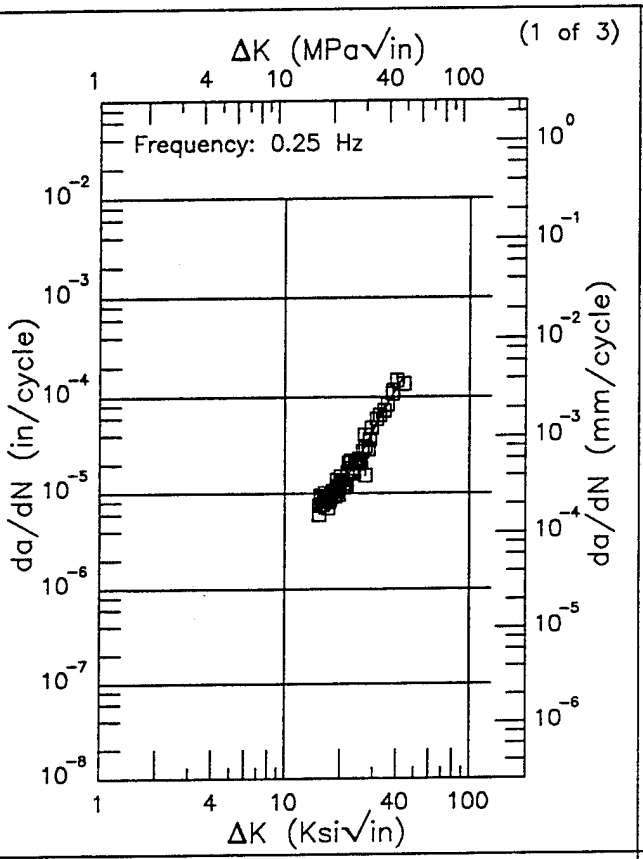
Figure 6.14.3.1.3 (Concluded)

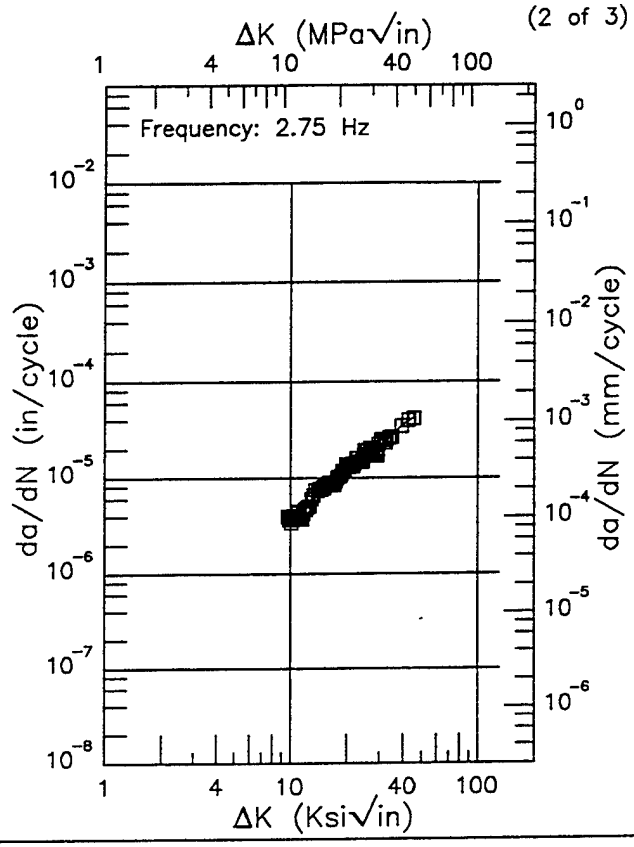
Ti-6-2-4-2 ELI

F

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Stress Ratio: 0.02
Environment: LAB AIR;1000°F

Yield Strength: 78 ksi
Ult. Strength: 96 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 - 3.002 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.33 (min)	8.44
16.	8.46
20.	11.6
25.	22.8
30.	44.9
35.	79.5
40.	123.
43.90 (max)	158.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.66 (min)	3.35
10.	3.56
13.	5.78
16.	8.54
20.	12.4
25.	16.9
30.	21.7
35.	27.7
40.	35.8
45.26 (max)	41.5

RMS % Error	Life Prediction Ratio Summary
15.34	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
7.50	0. .5 .8 1.25 2.

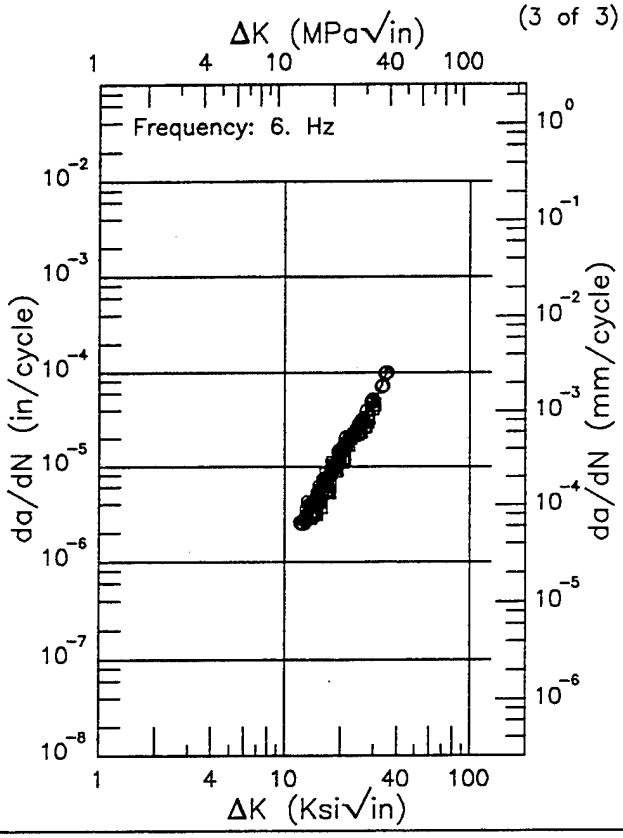
Figure 6.14.3.1.4

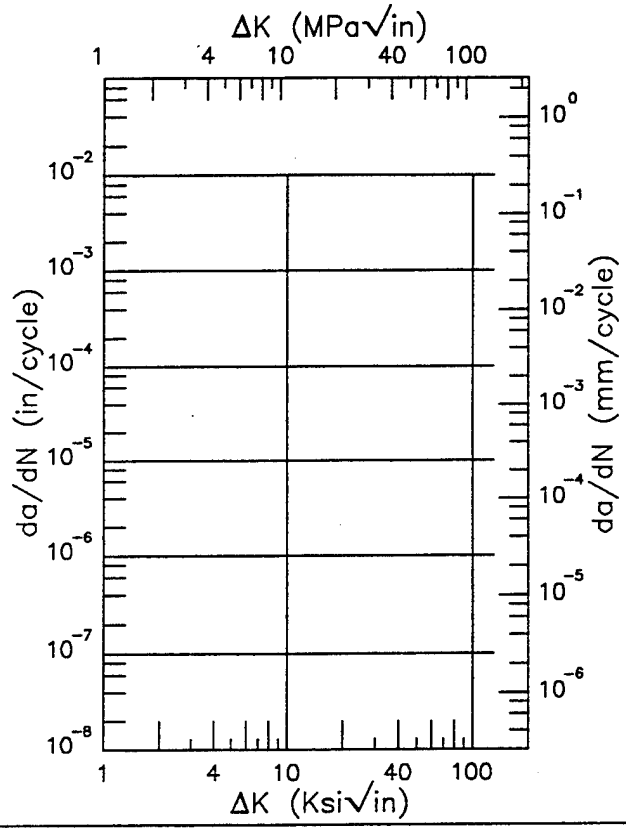
Ti-6-2-4-2 ELI F

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Stress Ratio: 0.02
Environment: LAB AIR;1000°F

Yield Strength: 78 ksi
Ult. Strength: 96 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 - 3.002 in.
Ref: MA016

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.06 (min)	2.55
13.	2.90
16.	5.64
20.	13.2
25.	25.9
30.	45.7
35.	97.3
35.37 (max)	104.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 13.42

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

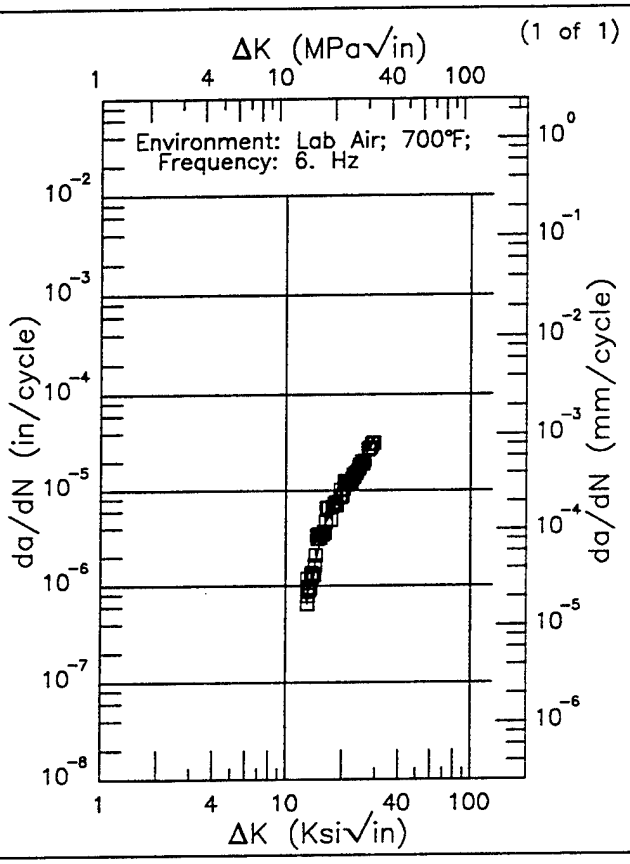
Figure 6.14.3.1.4 (Concluded)

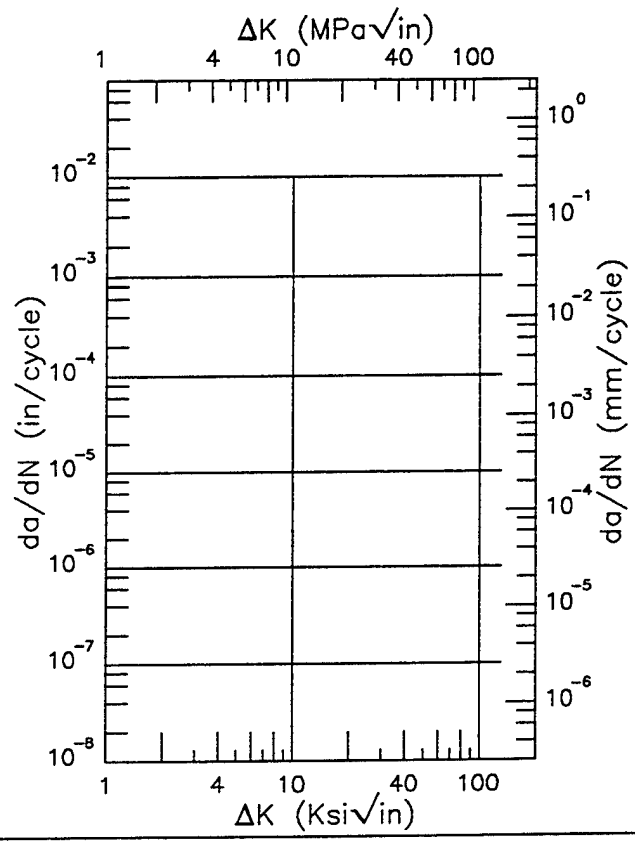
Ti-6-2-4-2 ELI

EF

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Stress Ratio: 0.02

Yield Strength: 95 ksi
Ult. Strength: 109 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3.001 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.93 (min)	0.712
13.	0.758
16.	4.20
20.	9.90
25.	17.8
29.36 (max)	35.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
17.14	0. .5 .8 1.25 2.

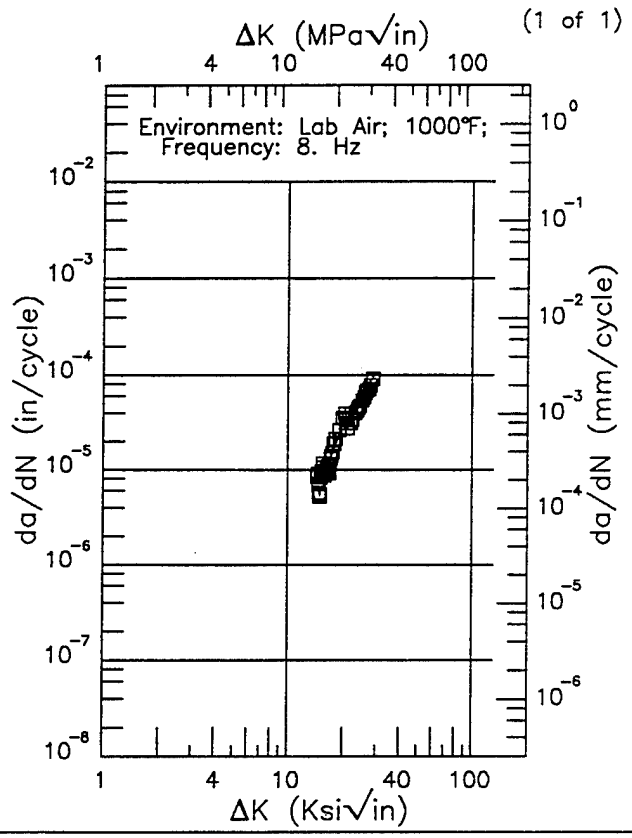
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

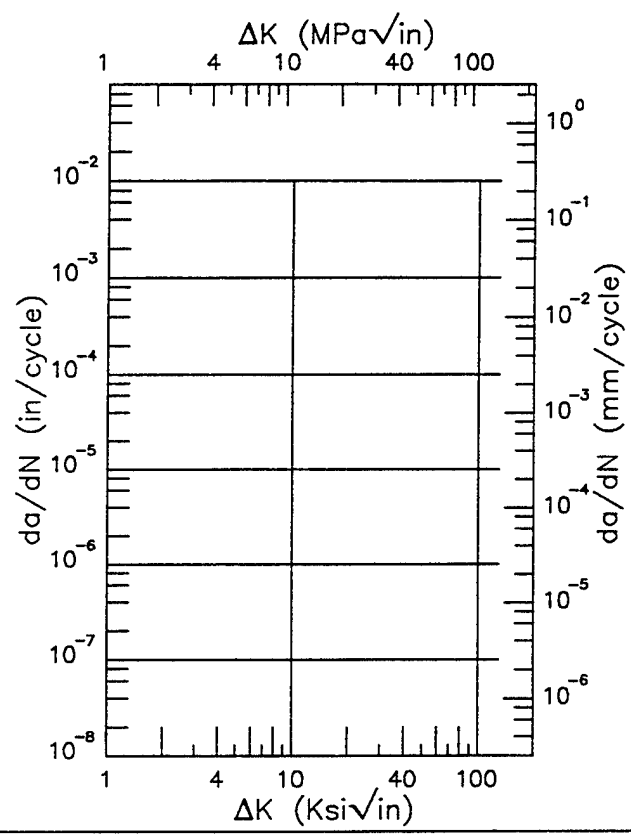
Figure 6.14.3.1.5

Ti-6-2-4-2 ELI EF

Condition/Ht: ANNEAL 1450F 1HR AC
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Stress Ratio: 0.5

Yield Strength: 78 ksi
Ult. Strength: 96 ksi
Specimen Thk: 0.187 in.
Specimen Width: 3 in.
Ref: MA016





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.36 (min)	7.49
16.	9.45
20.	31.5
25.	50.7
28.61 (max)	83.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
14.59	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.14.3.1.6

TABLE 6.15.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-4-6 AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
UNSPECIFIED	EXTRUSION	0.1	20			0.82	9.45		

TABLE 6.15.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6-2-4-6 AT ROOM TEMPERATURE

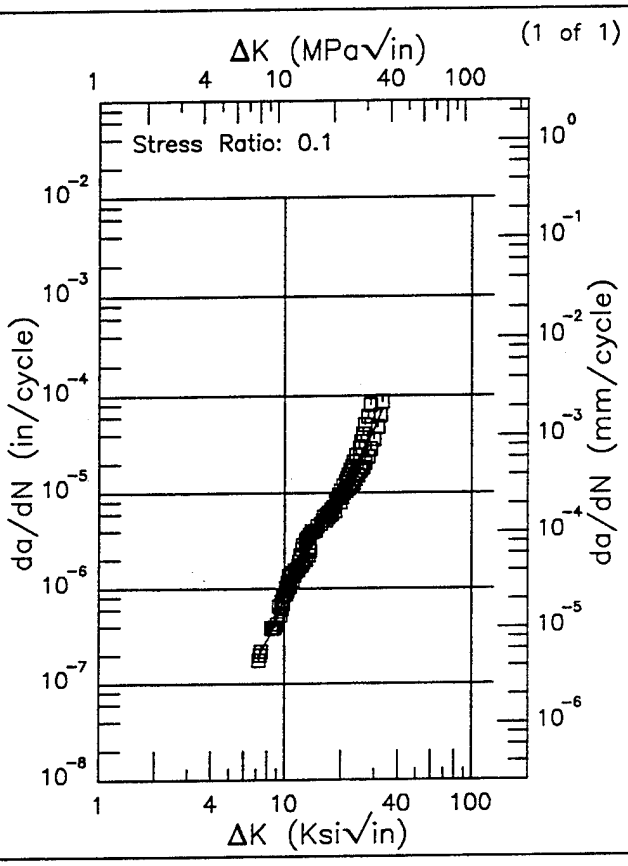
ORIENTATION: C-R **ENVIRONMENT: Lab Air**

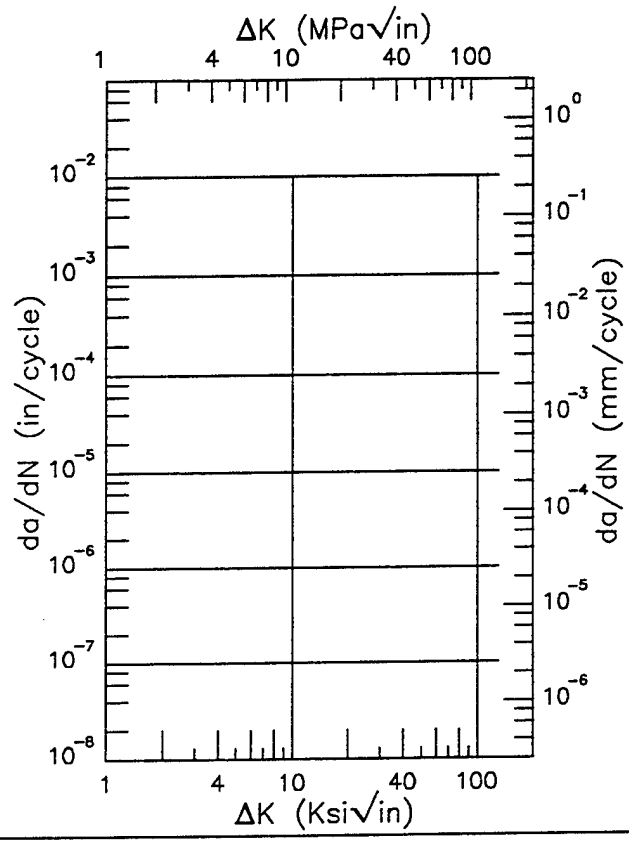
CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC	FORGING	0.1	30		0.1	1.01			
		0.7	0.16	0.06	0.55				

R | Ti-6-2-4-6 |

Condition/Ht:
Form: Extrusion
Specimen Type: CT
Orientation: L-T
Frequency: 20 Hz
Environment: LAB AIR; RT

Yield Strength: 147.2 ksi
Ult. Strength: 159.1 ksi
Specimen Thk: 0.3 in.
Specimen Width: 1.4 in.
Ref: UD001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.20 (min)	0.193
8.	0.286
9.	0.486
10.	0.816
13.	2.73
16.	5.12
20.	9.45
25.	23.3
30.	44.6
33.04 (max)	70.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
22.40	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.15.3.1.1

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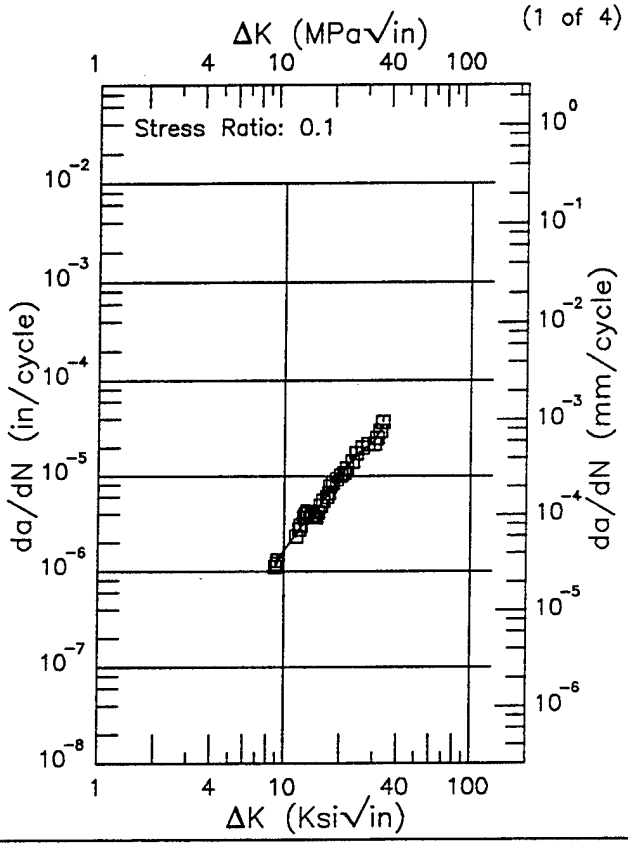
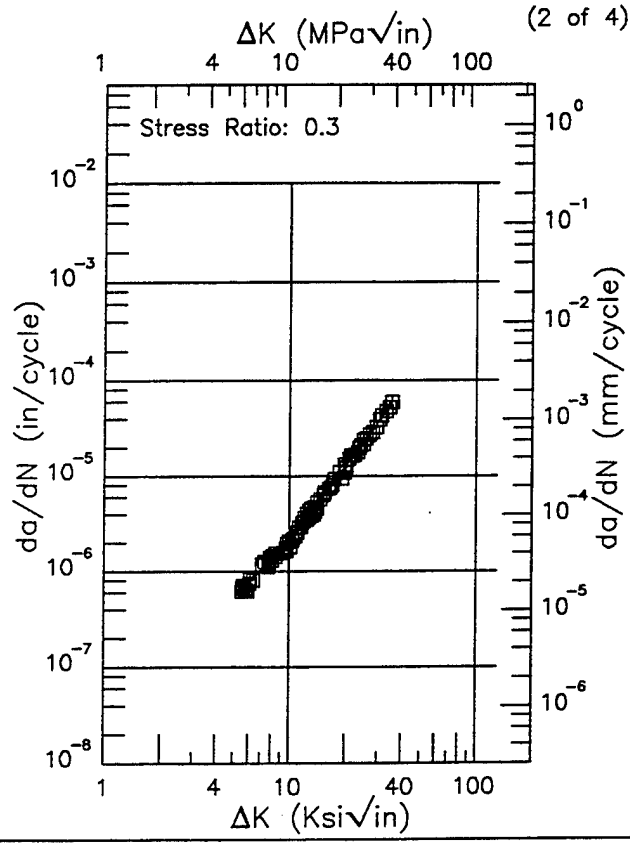
R

Ti-6-2-4-6

Condition/Ht:
Form: Extrusion
Specimen Type: CT
Orientation: L-T
Frequency: 20 Hz
Environment: LAB AIR;800°F

Yield Strength: 147.2 ksi
Ult. Strength: 159.1 ksi
Specimen Thk: 0.3 in.
Specimen Width: 1.4 in.
Ref: UD001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.87 (min)	1.09
9.	1.16
10.	1.66
13.	3.31
16.	5.41
20.	10.2
25.	17.6
30.	23.2
33.38 (max)	33.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.52 (min)	0.623
6.	0.741
7.	1.01
8.	1.31
9.	1.66
10.	2.07
13.	3.85
16.	6.87
20.	12.8
25.	21.9
30.	36.6
35.	56.1
35.34 (max)	57.3

RMS % Error	Life Prediction Ratio Summary
8.76	0. .5 .8 1.25 2.

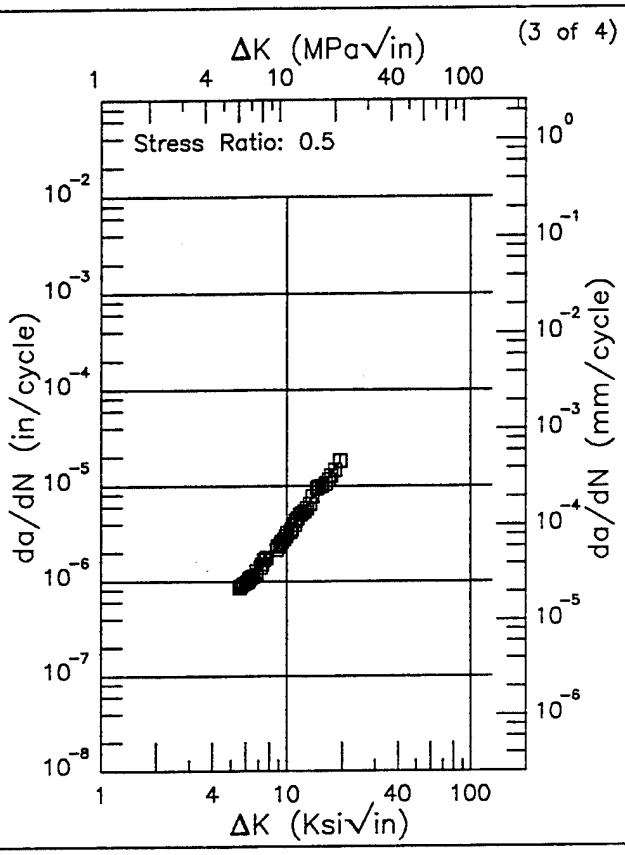
RMS % Error	Life Prediction Ratio Summary
7.55	0. .5 .8 1.25 2.

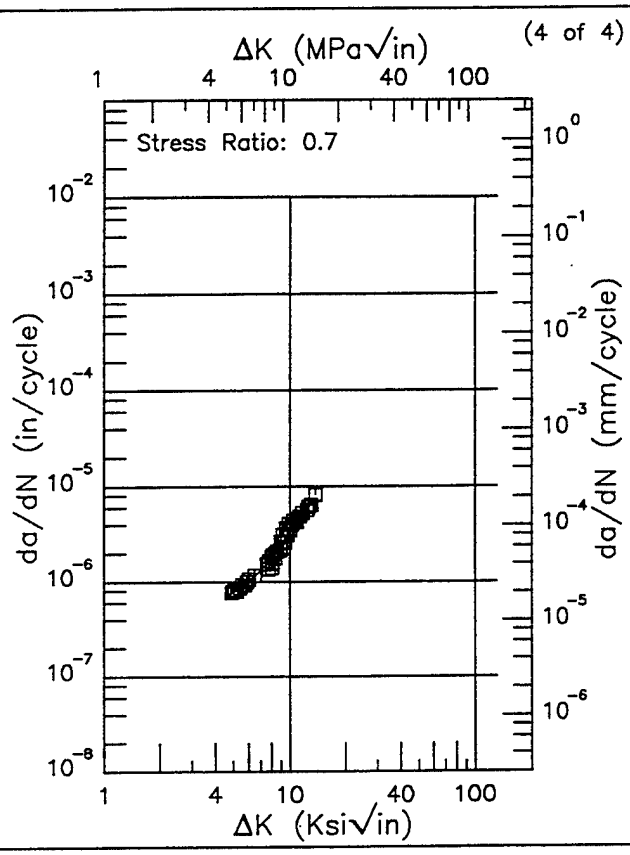
Figure 6.15.3.1.2

Ti-6-2-4-6 R

Condition/Ht:
Form: Extrusion
Specimen Type: CT
Orientation: L-T
Frequency: 20 Hz
Environment: LAB AIR;800°F

Yield Strength: 147.2 ksi
Ult. Strength: 159.1 ksi
Specimen Thk: 0.3 in.
Specimen Width: 1.4 in.
Ref: UD001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.54 (min)	0.814
6.	0.976
7.	1.35
8.	1.78
9.	2.31
10.	3.01
13.	6.52
16.	10.7
19.33 (max)	17.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.89 (min)	0.784
5.	0.798
6.	0.995
7.	1.32
8.	1.80
9.	2.48
10.	3.42
13.	6.74
13.67 (max)	7.16

RMS % Error	Life Prediction Ratio Summary
4.18	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.87	0. .5 .8 1.25 2.

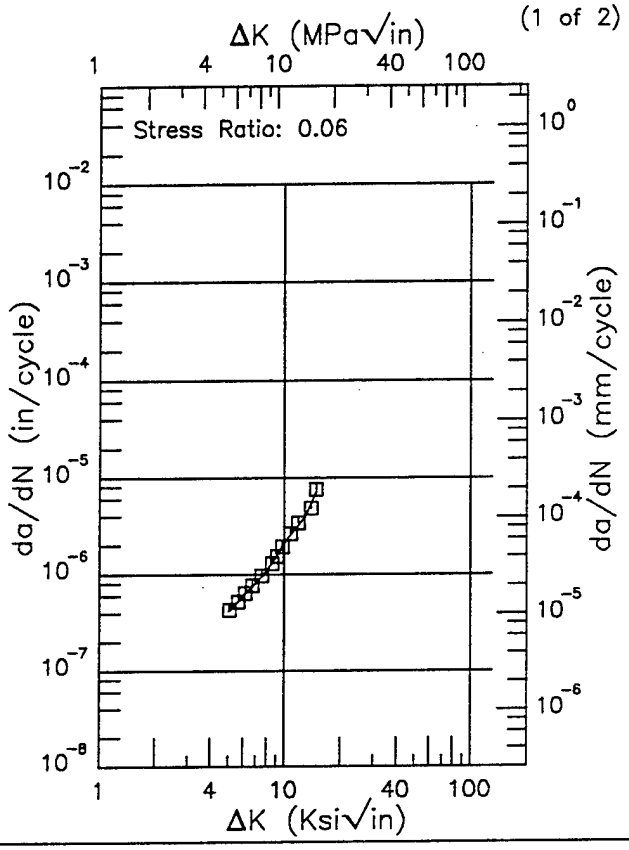
Figure 6.15.3.1.2 (Concluded)

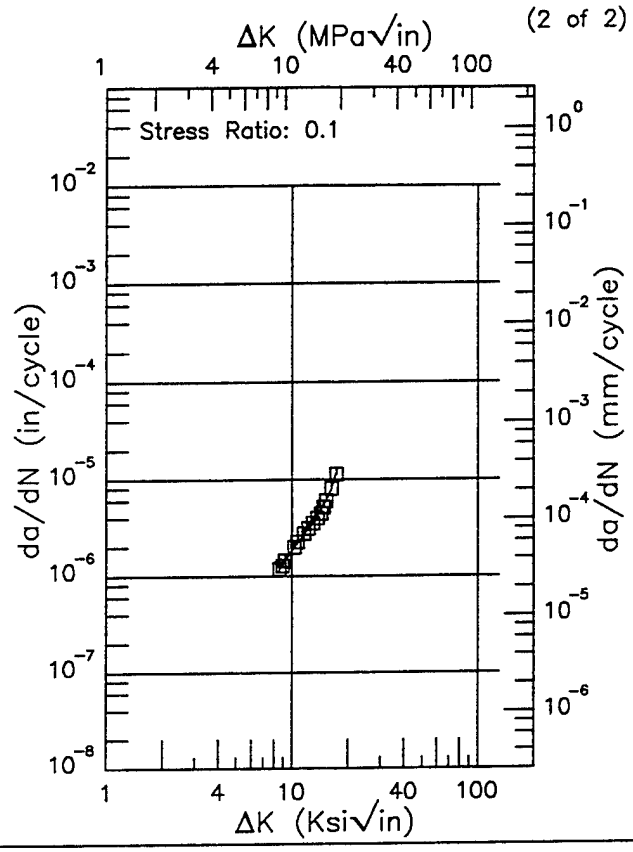
Ti-6-2-4-6

R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 1.8 – 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Frequency: 30 Hz
Environment: LAB AIR;800°F

Yield Strength: 165.5 – 166 ksi
Ult. Strength: 180.8 – 182.3 ksi
Specimen Thk: 0.077 – 0.082 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.05 (min)	0.417
6.	0.603
7.	0.805
8.	1.08
9.	1.52
10.	2.12
13.	4.00
14.76 (max)	7.28

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.51 (min)	1.13
9.	1.35
10.	1.83
13.	3.55
16.	7.15
17.28 (max)	11.4

RMS % Error	Life Prediction Ratio Summary
3.56	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
4.35	0. .5 .8 1.25 2.

Figure 6.15.3.1.3

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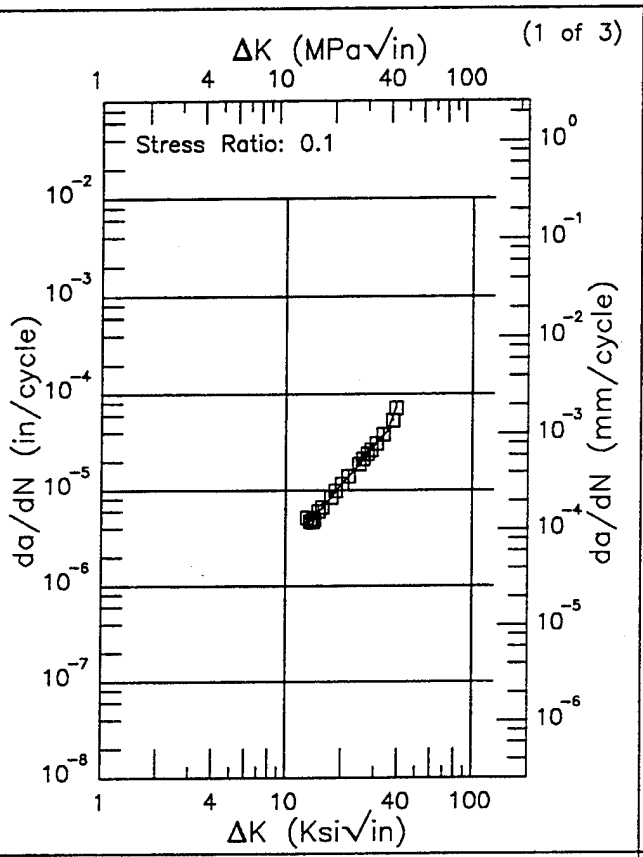
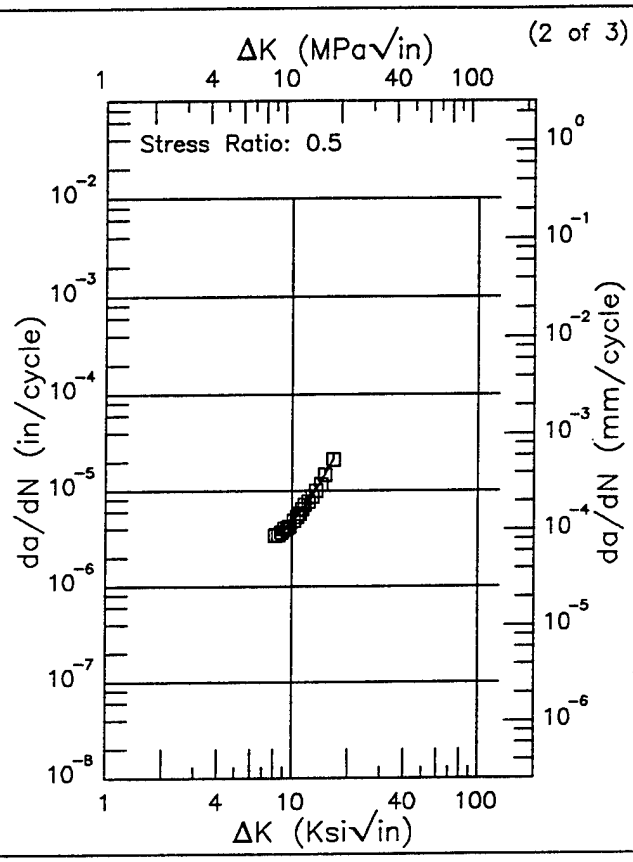
Ti-6-2-4-6

R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 1.8 – 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Frequency: 0.2 Hz
Environment: LAB AIR;800°F

Yield Strength: 165.5 – 166 ksi
Ult. Strength: 180.8 – 182.3 ksi
Specimen Thk: 0.079 – 0.083 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.03 (min)	4.53
16.	6.74
20.	11.8
25.	18.8
30.	29.7
35.	41.4
39.00 (max)	69.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.16 (min)	3.36
9.	3.77
10.	4.62
13.	9.03
16.	18.1
16.58 (max)	21.3

RMS % Error	Life Prediction Ratio Summary
5.05	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
2.60	0. .5 .8 1.25 2.

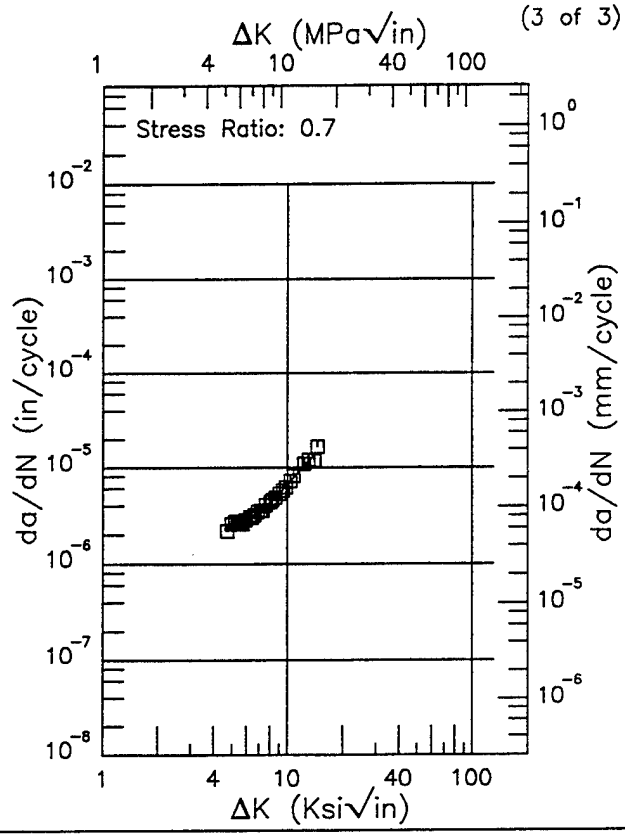
Figure 6.15.3.1.4

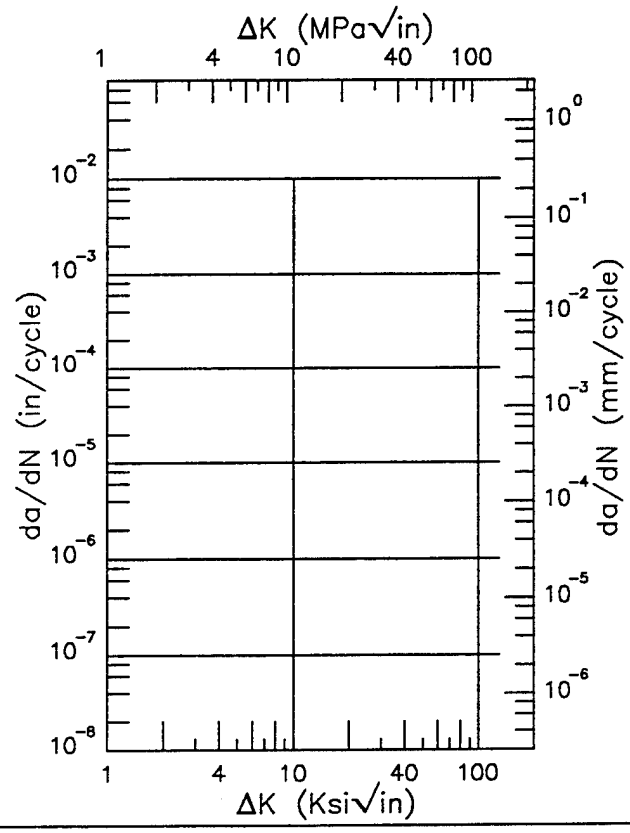
Ti-6-2-4-6 R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 1.8 – 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C–R
Frequency: 0.2 Hz
Environment: LAB AIR;800°F

Yield Strength: 165.5 – 166 ksi
Ult. Strength: 180.8 – 182.3 ksi
Specimen Thk: 0.079 – 0.083 in.
Specimen Width: 1.75 in.
Ref: PW002

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.73 (min)	2.46
5.	2.48
6.	2.81
7.	3.43
8.	4.31
9.	5.40
10.	6.71
13.	11.6
14.43 (max)	14.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.36	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

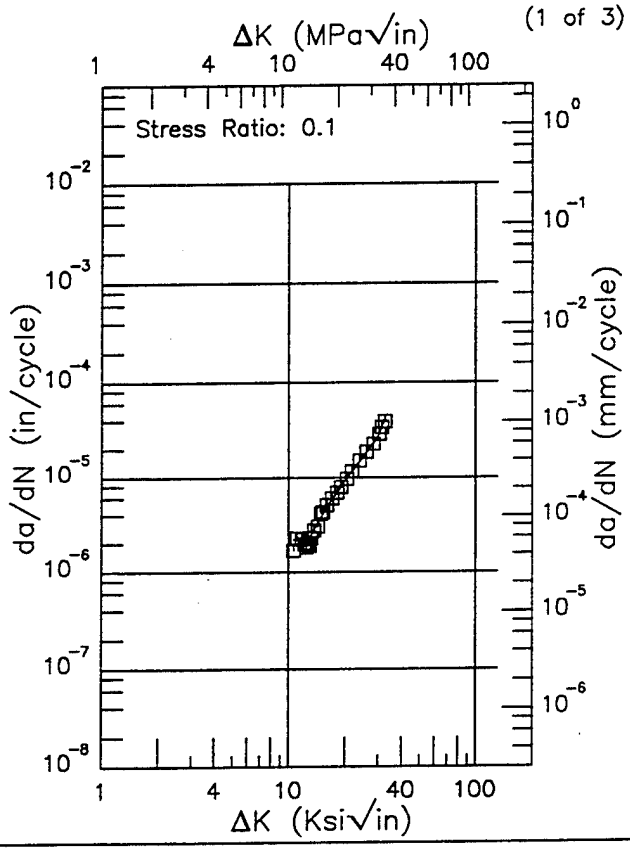
Figure 6.15.3.1.4 (Concluded)

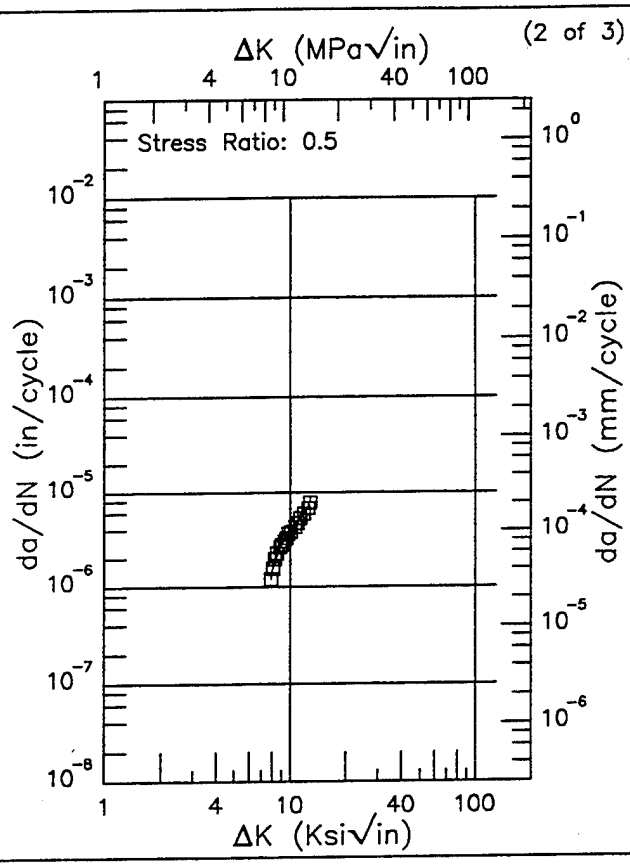
Ti-6-2-4-6

R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Frequency: 0.2 Hz
Environment: LAB AIR;600°F

Yield Strength: 166 ksi
Ult. Strength: 182.3 ksi
Specimen Thk: 0.08 - 0.081 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.60 (min)	2.18
13.	2.30
16.	4.93
20.	9.23
25.	17.0
30.	27.1
32.52 (max)	40.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.88 (min)	1.29
8.	1.48
9.	2.85
10.	3.69
12.83 (max)	7.34

RMS % Error	Life Prediction Ratio Summary
9.18	0. .5 .8 1.25 2.

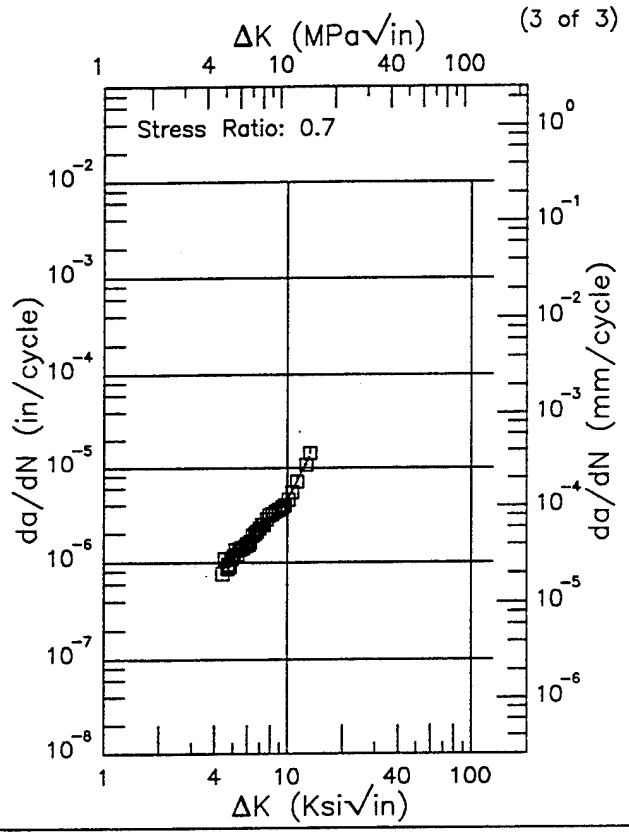
RMS % Error	Life Prediction Ratio Summary
4.98	0. .5 .8 1.25 2.

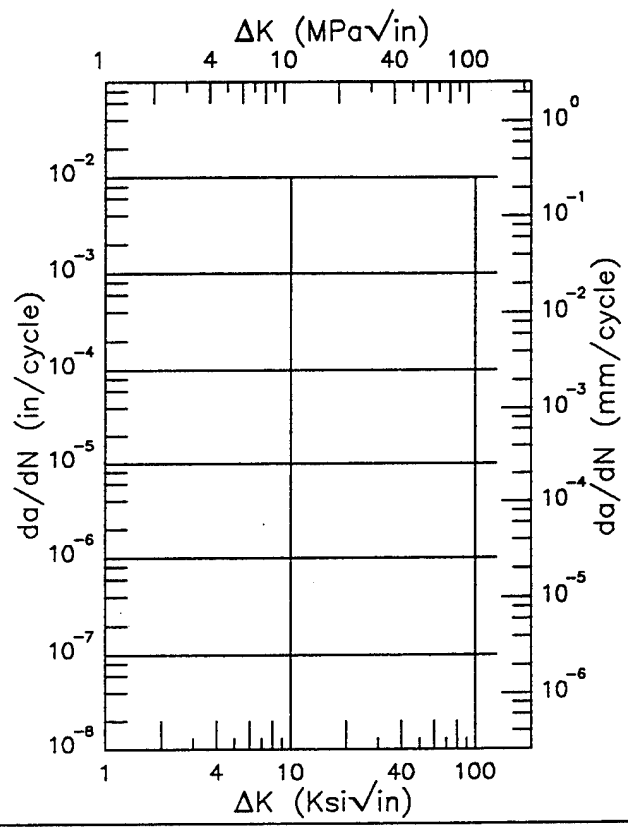
Figure 6.15.3.1.5

Ti-6-2-4-6 R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Frequency: 0.2 Hz
Environment: LAB AIR;600°F

Yield Strength: 166 ksi
Ult. Strength: 182.3 ksi
Specimen Thk: 0.08 - 0.081 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.41 (min)	0.881
5.	1.09
6.	1.60
7.	2.24
8.	2.94
9.	3.68
10.	4.57
13.	12.4
13.24 (max)	13.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
6.37	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.15.3.1.5 (Concluded)

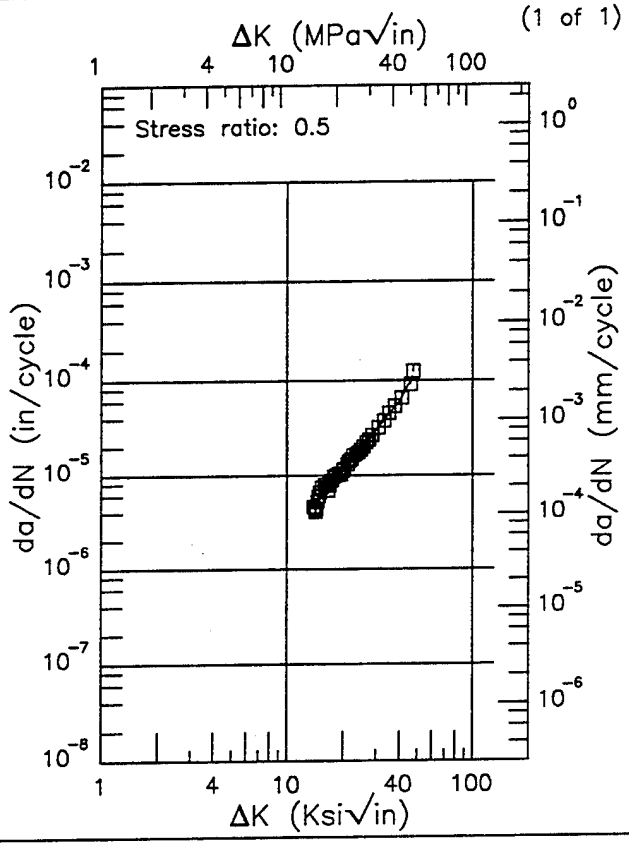
Ti-6-2-4-6

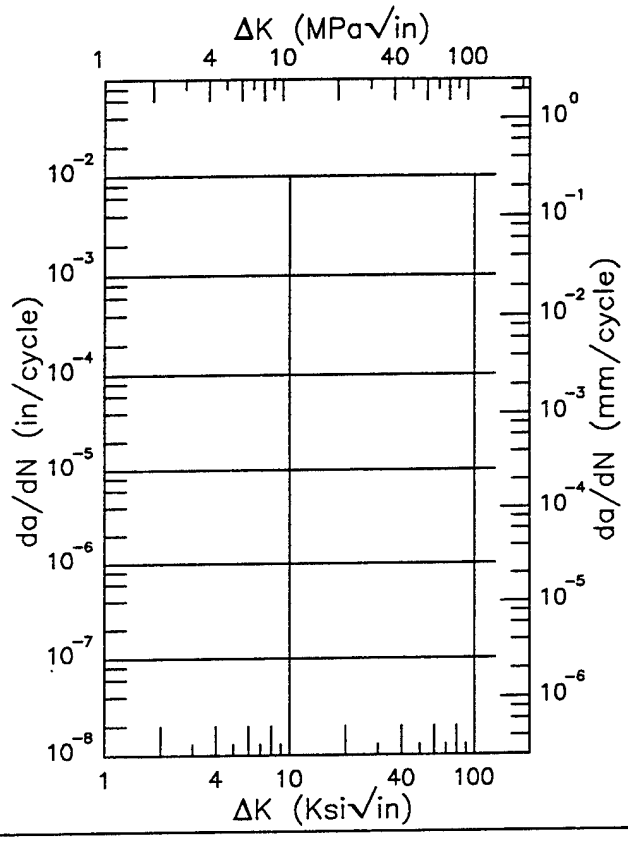
R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 1.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Frequency:
Environment: LAB AIR;600°F

Yield Strength: 165.5 ksi
Ult. Strength: 180.8 ksi
Specimen Thk: 0.074 in.
Specimen Width: 1.75 in.
Ref: PW002

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.85 (min)	4.48
16.	7.34
20.	11.9
25.	19.1
30.	30.2
35.	44.5
40.	60.2
47.39 (max)	110.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
6.98	0. .5 .8 1.25 2.

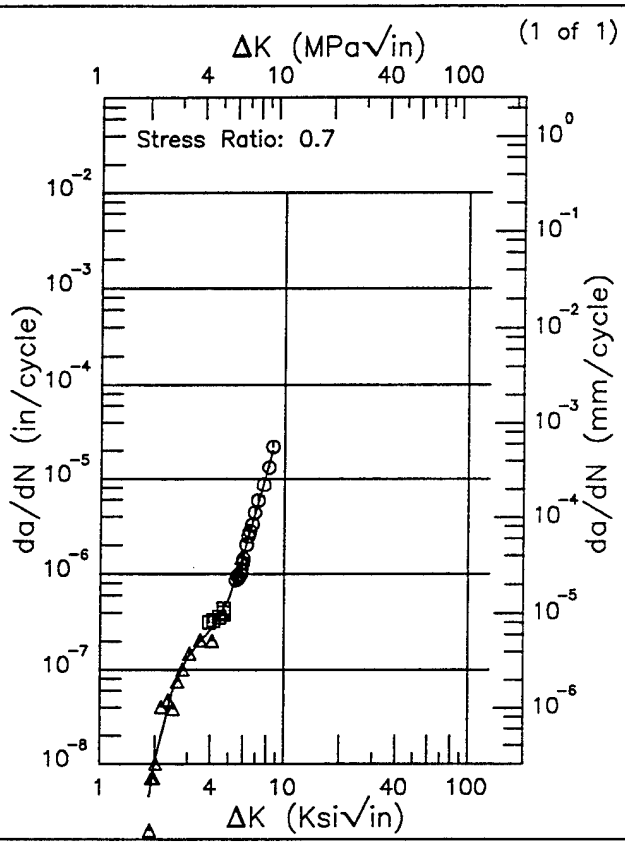
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

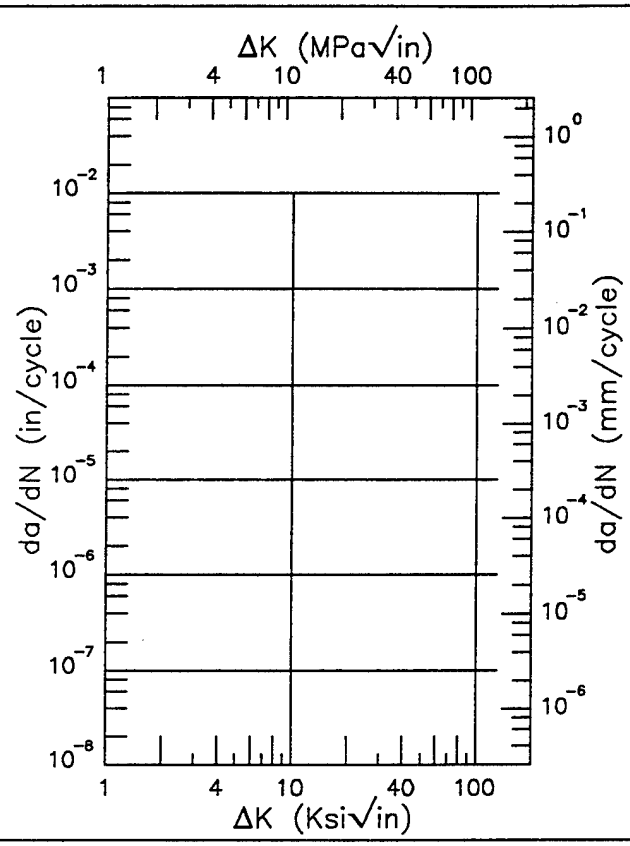
Figure 6.15.3.1.6

Ti-6-2-4-6 R

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Frequency: 0.2 Hz
Environment: LAB AIR; RT

Yield Strength: 166 ksi
Ult. Strength: 182.3 ksi
Specimen Thk: 0.079 - 0.08 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
1.86 (min)	0.00455
2.	0.0109
2.5	0.0645
3.	0.135
3.5	0.197
4.	0.264
5.	0.546
6.	1.57
7.	4.66
8.	11.9
8.59 (max)	20.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
24.36	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

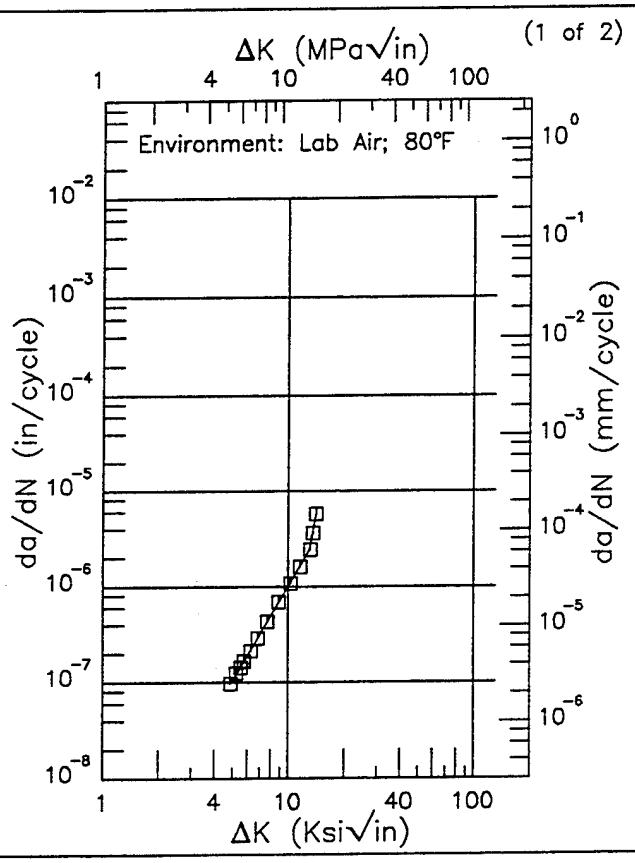
Figure 6.15.3.1.7

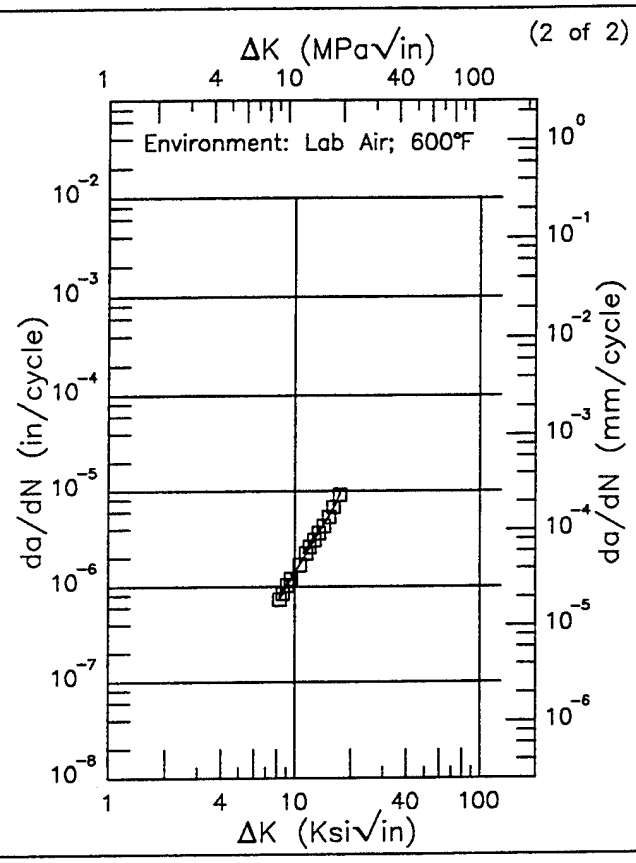
Ti-6-2-4-6

E

Condition/Ht: 1690F 2HRS AC 1550F 2HRS OQ 1100F 8HRS AC
Form: 2.8 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C-R
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength: 166 ksi
Ult. Strength: 182.3 ksi
Specimen Thk: 0.078 - 0.081 in.
Specimen Width: 1.75 in.
Ref: PW002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.87 (min)	0.0968
5.	0.105
6.	0.186
7.	0.312
8.	0.490
9.	0.723
10.	1.01
13.	2.39
14.06 (max)	5.80

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.23 (min)	0.729
9.	0.984
10.	1.40
13.	3.23
16.	6.33
17.43 (max)	9.10

RMS % Error	Life Prediction Ratio Summary
2.66	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
1.78	0. .5 .8 1.25 2.

Figure 6.15.3.1.8

TABLE 6.16.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY Ti-6Al-4V AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	1750F 1HR FC TO 1100F	---	---	---	91.5	2.1	2	---	---	---
	1750F 1HR FC TO RT	71.8	3.2	2	91.6	1.3	2	---	---	---
	1750F 2HR WQ 1000F 2HR AC 1300F 2HR AC STA	41.4	2.3	2	---	---	---	---	---	---
	ANNEALED 1375F 3HR AC	60.4	5.5	2	---	---	---	---	---	---
	BETA PROCESSED - MA	94.9	4.8	3	---	---	---	---	---	---
	MA	74.4	32.6	3	91.6	24.4	7	---	---	---
	RA	82.8	7.8	22	80.8	10.8	22	---	---	---
	STA	---	---	---	42.6	2.	3	---	---	---
Forging	1700F 6HR AC 1400F 6HR AC	75.9	4.2	6	81.2	5.8	6	---	---	---
	1750F 1HR WQ 1000F 4HR	---	---	---	79.3	4.9	3	---	---	---
	AB FORGED-MA ALPHA-BETA FORGED MA	---	---	---	35.4	2.7	4	---	---	---
	ANNEALED	70.8	15.9	4	67.3	13.6	6	---	---	---
	ANNEALED 1300F 4HR AC	58.1	1.2	3	62.2	3.	3	68.1	1.	2

TABLE 6.16.1.1 (CONCLUDED)

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY Ti-6Al-4V AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Forging (Cont'd)	B FORGED-MA BETA FORGED MA 1300F 2HR AC	70.6	4.9	3	---	---	---	---	---	---
	B FORGED-MA BETA FORGED MA 1300F 2HR AC	---	---	---	71.	0.4	3	73.9	2.5	2
	MA 1300F 2HR AC	50.9	6.9	4	49.5	3.9	3	43.6	5.8	3
	RA	83.6	5.5	41	83.9	6.9	50	88.9	3.2	9
Extrusion	ANNEALED	82.6	5.3	5	85.2	6.5	6	---	---	---
	MA	83.5	3.1	5	87.5	4.1	6	---	---	---
Forged Bar	AS RECEIVED	57.1	10.4	14	54.9	10.8	21	---	---	---
	B FORGED BETA FORGED REHEATED TO 1950F DRAWN TO SIZE	---	---	---	42.6	4.3	4	---	---	---
Billet	ANNEALED	79.6	9.6	2	---	---	---	---	---	---
	ANNEALED 1000F 2HR AC	50.9	0.6	2	---	---	---	---	---	---
	DBA	68.2	9.7	9	64.2	11.8	13	---	---	---
	MA 1300F 2HR AC	84.	3.4	3	---	---	---	---	---	---

TABLE 6.16.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-S **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.1	10			1.11	12.82		

TABLE 6.16.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	FORGING	0.1	1			0.37	14.31		
	EXTRUSION	0.1	1			0.39	7.49		
		0.8	1		0.22	1.37			

TABLE 6.16.1.2.3

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Dry Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	6			0.15	8.39	111.47	
		0.3	6			0.29	10.1		
		0.5	6			1.15	11.38		
BETA PROCESSED - MA	SHEET	0.1	10					52.46	
	PLATE	0.1	10				4.72	42.1	
DBTC	PLATE	0.08	1				16.7	757.11	
		0.3	1			0.6	18.69		
		0.3	1				12.85	281.01	
MA	SHEET	0.08	1-6			1.67	13.5		
		0.3	6			2.27			
		0.5	6			2.3	21.08		
	PLATE	0.3	1				69.42		
		0.3	1				21.56		
		0.3	1-6			0.43	16.1	361.47	
	EXTRUSION	0.08	6				11.99		

TABLE 6.16.1.2.3 (CONCLUDED)

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Dry Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA	EXTRUSION	0.08	6			0.34	12.64		
		0.3	6				16.36		
		0.5	6				16.88		
RA	PLATE	0.08	6			0.44	10.09	204.33	
		0.3	6			1.46	13.34		
		0.5	6			2.16	18.1		
		0.7	6			3.21			
	FORGING	0.08	1			0.39	5.83	172.77	
		0.08	6				6.58		
		0.3	6			1.16	15.47	338.75	

TABLE 6.16.1.2.4

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	0.1				3.75	111.63	
		0.3	0.1				9.28		
		0.5	0.1				11.75	999.86	

TABLE 6.16.1.2.5

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: JP4**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	FORGING	0.02	0.1-20				2.11	91.55	
MA	SHEET	0.08	6			1.56	13.92		
RA	PLATE	0.08	1			0.64	12.39		
	FORGING	0.08	1				4.95		

TABLE 6.16.1.2.6

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ALPHA-BETA FORGE-ANNEALED	FORGING	0.1	30			1.02			
		0.1	30		0.05				
		0.1	30		0.05				
ANNEALED	FORGING	-1	5			0.87	10.33		
		0.1	5			0.29	9.53		
		0.1	15				11.12		
		0.1	20			0.38			
		0.4	10		0.05	1.32	16.33		
		0.4	20		0.02	1.09	17.6		
		0.8	15		0.07				
	EXTRUSION	-1	5			0.41	7.29		
		0.1	8			0.34	11.63		
		0.1	15				8.68	242.97	
		0.1	20			0.18			
		0.4	15		0.03	0.57	16.54		

TABLE 6.16.1.2.6 (CONTINUED)

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	EXTRUSION	0.8	10		0.13	1.68			
		0.8	15		0.1	1.37			
		0.8	30		0.08	1			
	BILLET	0.02	10-20			0.27	11.05		
ANNEALED AT 1375F 3HRS AC	PLATE	0.02	10-20			0.25	11.03		
BA	FORGING	0.02	0.1-20				2.55	105.12	
BETA PROCESSED - MA	PLATE	0.1	1				0.87		
		0.5	1			1.84			
MA	PLATE	-1	10			1.14	12.91	322.86	
		0.02	0.1-20			0.32	10.8		
		0.02	1-27			0.11			
		0.02	0.1-30			0.15	6.77		
		0.02	5-30		0.02	0.4	15.79		
		0.04	20					93.19	
		0.05	20				6.34		

TABLE 6.16.1.2.6 (CONCLUDED)

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA	PLATE	0.3	20			0.99			
		0.5	10			8.51	97.18		
	FORGING	0.02	1-30				8.18	292.11	
	EXTRUSION	0.1	10			4.64			
		0.1	1-10				9.35	189.23	
		0.1	1-20				12.2	225.55	
		0.3	10		0.39	8.82			
	UNSPECIFIED	0.55	10		0.84				

TABLE 6.16.1.2.7

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: S.S.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	FORGING	0.02	0.1-20				4.83	154.25	
MA	EXTRUSION	0.1	1-10				11.38	270.5	

TABLE 6.16.1.2.8

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	1				11.02	160.87	
DBTC	PLATE	0.08	1			0.59	13.52		
MA	SHEET	0.08	1			3.24			
	PLATE	0.3	1				75.32		
		0.3	1			0.63	34.25		
	EXTRUSION	0.1	1-10				10.89	210.05	
RA	PLATE	0.08	0.1-1			0.71	12.91		
		0.08	1			1.19	22.42	254.77	
		0.08	1			0.37	8.03		
		0.3	1			2.2	24.11		
		0.5	1			4.18			
	FORGING	0.08	1			1.58	38.76		

TABLE 6.16.1.2.9

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-S **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	10			0.62	18.38		
RA	PLATE	0.1	10				49.71		

TABLE 6.16.1.2.10

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	1				37.41	255.71	
		0.1	10			0.79	13.63	102.98	
RA	PLATE	0.	15			0.63			
		0.1	0.1			3.5	44.65		
		0.1	0.1						
		0.1	10			4.91	61.29		
		0.1	10				57.53		
		0.5	0.1			2.03			
		0.5	1			2.67	114.91		
		0.5	10			34.23	170.88		
RA(FAST COOLED)	PLATE	0.1	1				29.74		
STRESS RELIEVED E.B. WELDMENT (HAZ)	WELDMENT	0.1	10				9.28		
STRESS RELIEVED E.B. WELDMENT (WELD ZONE)	WELDMENT	0.1	0.1						

TABLE 6.16.1.2.11

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: ALT JP4/H_2O (D)**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.5	1			1.66	37.77		

TABLE 6.16.1.2.12

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	FORGING	0.1	1		0.15	2.64	28.49		
		0.8	1		8.14	17.51			
	EXTRUSION	0.1	1				7.72		
		0.8	1		0.34	2.04			
BA	PLATE	0.1	0.1					123.05	
RA	PLATE	0.	15			0.43			
		0.1	0.1				22.52	270.27	
		0.5	0.1				21.8		
		0.5	1			2.77	28.03		
STRESS RELIEVED E.B. WELDMENT (WELD ZONE)	WELDMENT	0.1	0.1						
		0.1	10						

TABLE 6.16.1.2.13

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Dry Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
DB	PLATE	0.08	6			0.33	12.47		
		0.3	6				34.69		
DBTC	PLATE	0.08	1				7.71	161.59	
		0.3	1			0.49	12.28	276.36	
MA	SHEET	0.08	6				9.53		
	EXTRUSION	0.08	6				12.12		
RA	PLATE	0.08	6			0.43	10.76		
		0.08	6			0.46	11.32	232.73	
		0.1	0.1					224.79	
		0.5	0.1			1.08	20.39		
		0.5	1				18.21		
	FORGING	0.08	6				7.57	137.41	
		0.5	6			2.62	19.72		

TABLE 6.16.1.2.14

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: F.C.S.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.08	1				9.1		

TABLE 6.16.1.2.15

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.1	10			3.86	22.11		
		0.1	10				14.61		
		0.5	10		0.34	3.66	65.81		
		0.5	10			6.41	26.62		

TABLE 6.16.1.2.16

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: JP4**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	FORGING	0.02	0.1-20				2.09	97.77	
RA	PLATE	0.08	1			0.69	14.92		
STRESS RELIEVED E.B. WELDMENT (HAZ)	WELDMENT	0.1	0.1				14.55	621	
		0.1	10				9.36		

TABLE 6.16.1.2.17

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	FORGING	0.1	5				13.11		
		0.1	20			0.65	12.14		
		0.4	10		0.1	2.41	18.6		
		0.4	20		0.05	1.41	17.34		
		0.8	15		0.23				
		0.8	30		0.25	6.32			
	EXTRUSION	0.1	5-10			0.34	7.95		
		0.1	15				5.84	161.87	
		0.1	20		0.01	0.2			
		0.4	5-15		0.06	0.84	14.05		
		0.4	15		0.03	0.4	13.39		
		0.8	30		0.08	0.87			
AS WELDED E.B. WELDMENT (HAZ)	WELDMENT	0.1	10				6.52		
AS WELDED E.B. WELDMENT (WELD ZONE)	WELDMENT	0.1	10				5.94		
BA	FORGING	0.02	0.1-20				1.93	94.89	

TABLE 6.16.1.2.17 (CONCLUDED)

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA	EXTRUSION	0.1	5-20				13.75	276.81	
RA	PLATE	0.1	10				23.53		
STRESS RELIEVED E.B. WELDMENT (HAZ)	WELDMENT	0.1	10				11.35	508.19	
STRESS RELIEVED E.B. WELDMENT (WELD ZONE)	WELDMENT	0.1	10				10.93		

TABLE 6.16.1.2.18

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.S.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	FORGING	0.02	0.1-20				3.76	126.14	
MA	EXTRUSION	0.1	1-10				17.18	209.03	

TABLE 6.16.1.2.19

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	0.1			0.58	6.43	400.25	
		0.1	1				36.67	185.25	
		0.1	10				20.7	98.95	
DB	PLATE	0.08	1				7.9	225.95	
DB + 2DBTC	PLATE	0.08	1				7.62	249.01	
DB + 4DBTC	PLATE	0.08	1				9.51	170.63	
DBT + PC	PLATE	0.08	1				11.06		
DBTC	PLATE	0.08	1			2.81	17.87		
MA	EXTRUSION	0.08	1			0.62	11.14		
		0.1	1-10				25.92	354.12	
RA	PLATE	0.	15			0.65			
		0.08	1			2.08	48.68		
		0.08	1			0.83	10.46	294.78	
		0.1	0.1					820.85	
		0.1	0.1						

TABLE 6.16.1.2.19 (CONCLUDED)

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.5	1			2.01	51.26		
	FORGING	0.08	1			0.75	16.9	235.07	
		0.08	1			0.62	14.24	185.08	
		0.5	1			3.41	58.02		

TABLE 6.16.1.2.20

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: STW/JP4**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
DBTC	PLATE	0.08	1			0.45	4.92		

TABLE 6.16.1.2.21

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: WATER SAT JP4**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.1	0.1					215.68	
		0.5	0.1				17.23		
		0.5	1			1.55	19.06		

TABLE 6.16.1.2.22

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: S-T **ENVIRONMENT: Dry Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
DB + 2DBTC	PLATE	0.08	6				7.97		

TABLE 6.16.1.2.23

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: S-T **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi√in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
DB	PLATE	0.08	1			0.72	19.87		
DB + TR	PLATE	0.08	1				9.96		

TABLE 6.16.1.2.24

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: R-C **ENVIRONMENT: Argon**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	6.0	10.0	20.0	60.0	100.0
1550F 4HRS FC 1000F 4HRS Argon COOLED	FORGING	0.1	10				4.31		
1750F 4HRS Argon COOLED	FORGING	0.1	10				4.38		
1950F 4HRS WQ 1000F 4HRS Argon COOLED	FORGING	0.1	10				2.52	147.7	

TABLE 6.16.1.2.25

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Argon**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1750F 4HRS Argon COOLED	FORGING	0.1	10				5		
1950F 4HRS WQ 1000F 4HRS Argon COOLED	FORGING	0.1	10				3.63		

TABLE 6.16.1.2.26

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
1775F 1HR WQ 1675F 1HR WQ 1000F 4HR AC	DISK	0.05	0.33-10					162.45	
1775F 1HR WQ 1675F 1HR WQ 1000F-1200F 2-8HR AC	DISK	0.03	0.33			0.82	11.45		
		0.03	0.5				9.93		
		0.25	0.33				22.1		
		0.25	0.5				17.73		
UNSPECIFIED	UNSPECIFIED	-1	0.16			1.14			
		-0.5	0.16			1.21			
		0.1	20				10.35		
		0.3	20			1.66	16.26		
		0.5	20			1.82			
		0.7	20		0.15				

TABLE 6.16.1.2.27

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V AT ROOM TEMPERATURE

ORIENTATION: UNSPECIFIED **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	6.0	10.0	20.0	50.0	100.0
BA	SHEET	0.1	10			1.84	14.44	122.21	
		0.1	10			4.66			
		0.3	10				14.91	210.93	
		0.7	10			3.87	26.35		
HIP 1650F 15 KSI	CASTING	0.1	0.1-20			0.16	5.23		
UNSPECIFIED	UNSPECIFIED	0.1	30			1.33			

TABLE 6.16.2.1

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1450F 1HR AC	Plate	1.00	R.T.	T-L	146.0	---	1.000	CT	---	0.23	44.00	---	---	1981	NR001
1700F 6 HR AC 1400F 6 HR AC	Forging	1.40	R.T.	L-T	118.0	3.006	1.317	CT	1.605	0.97	74.10	75.9	4.2	1973	85857
		1.40			119.0	3.002	1.365	CT	1.615	1.16	81.20			1973	85857
		1.40			119.0	3.002	1.251	CT	1.587	0.91	71.60			1973	85857
		1.40			119.0	3.004	1.350	CT	1.588	1.16	81.10			1973	85857
		1.40			119.0	3.005	1.301	CT	1.583	0.94	73.00			1973	85857
		1.40			120.0	3.002	1.290	CT	1.604	1.07	74.40			1973	85857
1700F 6 HR AC 1400F 6 HR AC	Forging	1.40	R.T.	T-L	126.0	3.001	1.357	CT	1.564	1.17	86.30	81.2	5.8	1973	85857
		1.40			126.0	3.002	1.311	CT	1.599	0.91	76.00			1973	85857
		1.40			127.0	3.004	1.353	CT	1.617	1.18	87.50			1973	85857
		1.40			129.0	3.006	1.325	CT	1.500	0.88	74.80			1973	85857
		1.40			129.0	3.005	1.279	CT	1.568	1.09	85.20			1973	85857
		1.40			129.0	3.006	1.336	CT	1.632	0.92	77.10			1973	85857
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	-75	T-L	159.0	5.100	2.000	WOL-CT EQ.	1.998	0.43	66.30	68.2	2.6	1966	76411
		3.00			159.0	5.100	2.000	WOL-CT EQ.	2.091	0.48	70.00			1966	76411
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	-40	T-L	153.0	5.100	2.000	WOL-CT EQ.	2.088	0.63	76.80	71.5	7.5	1966	76411
		3.00			153.0	5.100	2.000	WOL-CT EQ.	2.059	0.47	66.20			1966	76411
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	0	T-L	147.0	5.100	2.000	WOL-CT EQ.	1.998	0.51	66.40	69.7	4.6	1966	76411
		3.00			147.0	5.100	2.000	WOL-CT EQ.	2.081	0.61	72.90			1966	76411

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)^2 (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	32	T-L	148.0	5.100	2.000	WOL-CT EQ.	2.041	0.47	64.40	65.0	0.8	1966	76411
		3.00			148.0	5.100	2.000	WOL-CT EQ.	2.011	0.49	65.50			1966	76411
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	R.T.	T-L	140.0	5.100	2.000	WOL-CT EQ.	1.986	0.91	84.90	79.3	4.9	1966	76411
		3.00			140.0	5.100	2.000	WOL-CT EQ.	2.019	0.75	76.60			1966	76411
		3.00			140.0	5.100	2.000	WOL-CT EQ.	2.010	0.74	76.30			1966	76411
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	100	T-L	133.0	5.100	2.000	WOL-CT EQ.	1.969	0.75	72.90	71.1	2.5	1966	76411
		3.00			133.0	5.100	2.000	WOL-CT EQ.	2.049	0.68	69.30			1966	76411
1750F 1 HR WQ 1000F 4 HR	Forging	3.00	150	T-L	127.0	5.100	2.000	WOL-CT EQ.	1.970	0.85	74.00	78.0	5.7	1966	76411
		3.00			127.0	5.100	2.000	WOL-CT EQ.	2.033	1.00	82.00			1966	76411
1750F 1HR FC TO 1100F AC	Plate	1.50	R.T.	L-T	120.0	4.005	1.501	CT	1.991	1.20	83.00	---	---	1973	85836
1750F 1HR FC TO 1100F AC	Plate	1.50	R.T.	T-L	120.0	4.004	1.501	CT	1.938	1.41	90.00	91.5	2.1	1973	85836
		1.50			120.0	4.000	1.500	CT	---	1.50	93.00			1974	89004
1750F 1HR FC TO RT	Plate	1.50	R.T.	L-T	120.0	4.004	1.502	CT	1.717	0.84	69.50	71.8	3.2	1973	85836
		1.50			120.0	4.004	1.501	CT	1.718	0.95	74.00			1973	85836
1750F 1HR FC TO RT	Plate	1.50	R.T.	T-L	120.0	4.008	1.502	CT	1.956	1.43	90.60	91.6	1.3	1973	85836
		1.50			120.0	4.003	1.502	CT	1.986	1.49	92.50			1973	85836
1750F 2 HR FC TO 900F AT 100F/HR AC	Forging	3.00	R.T.	L-T	115.0	3.005	1.500	CT	1.716	1.20	79.80	---	---	1973	88440
1750F 2 HR FC TO 900F AT 100F/HR AC	Forging	3.00	R.T.	T-L	130.0	3.005	1.500	CT	1.581	1.21	90.50	---	---	1973	88440
1750F 2HR WQ 1000F 2HR AC 1300F 2 HR AC STA	Plate	0.62	R.T.	L-T	150.0	3.501	0.634	CT	1.865	0.17	39.80	41.4	2.3	1973	85836
		0.62			150.0	3.501	0.633	CT	1.880	0.20	43.00			1973	85836

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
AB FORGED-MA ALPHABETA-FORGED MILL ANNEALED	Forging	---	R.T.	---	133.0	2.500	1.250	CT	1.250	0.57	63.60	58.5	4.4	1973	90584 (1)
		---			133.0	2.500	1.250	CT	1.250	0.50	59.40			1973	90584 (1)
		---			134.0	2.500	1.250	CT	1.250	0.62	66.50			1973	90584 (1)
		---			134.0	2.500	1.250	CT	1.250	0.41	54.10			1973	90584 (1)
		---			134.0	2.500	1.250	CT	1.250	0.43	55.90			1973	90584 (1)
		---			134.0	2.500	1.250	CT	1.250	0.44	56.30			1973	90584 (1)
		2.75			136.0	2.000	1.000	CT	1.000	0.44	57.20			1974	88962 (2)
		2.75			136.0	2.000	1.000	CT	1.000	0.41	55.20			1974	88962 (2)
AB FORGED-MA ALPHA-BETA-FORGED MILL ANNEALED	Forging	2.25	R.T.	T-L	145.0	2.000	1.000	CT	1.065	0.18	38.60	35.4	2.7	1973	86688
		2.25			145.0	3.000	1.500	CT	1.556	0.12	32.20			1973	86688
		2.25			145.0	2.000	1.000	CT	1.071	0.15	36.00			1973	86688
		2.25			145.0	2.000	1.000	CT	1.074	0.14	34.90			1973	86688
AB FORGED-RA ALPHA-BETA FORGED RECRYSTALLIZED ANNEAL 1700F 4 HR FC TO 1000F AC	Forging	---	R.T.	---	128.0	2.500	1.250	CT	1.250	0.74	69.90	67.8	3.3	1973	90584 (1)
		---			128.0	2.500	1.250	CT	1.250	0.79	72.10			1973	90584 (1)
		---			128.0	2.500	1.250	CT	1.250	0.72	68.60			1973	90584 (1)
		---			128.0	2.500	1.250	CT	1.250	0.70	68.00			1973	90584 (1)
		---			128.0	2.500	1.250	CT	1.250	0.74	69.60			1973	90584 (1)
		---			128.0	2.500	1.250	CT	1.250	0.70	67.70			1973	90584 (1)
		---			132.0	2.500	1.250	CT	1.250	0.60	64.50			1973	90584 (1)
		---			132.0	2.500	1.250	CT	1.250	0.54	61.70			1973	90584 (1)

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 \cdot (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi $\cdot \sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED	Forging	1.00	-65	L-T	153.3	2.003	1.001	CT	1.020	0.36	58.20	54.9	5.9	1987	DA006
		1.00			153.3	2.006	0.999	CT	1.074	0.36	58.50			1987	DA006
		3.00			157.4	2.000	1.000	CT	1.023	0.23	48.10			1987	DA007
ANNEALED	Forging	3.00	-65	T-L	154.5	2.000	0.958	CT	1.046	0.22	46.30	46.2	1.5	1987	DA007
		3.00			154.5	2.000	0.998	CT	1.043	0.24	47.60			1987	DA007
		1.50			166.2	3.010	1.491	CT	1.656	0.18	44.10			1987	DA006
		1.50			166.2	3.012	1.491	CT	1.628	0.20	46.87			1987	DA006
ANNEALED	Forging	3.00	R.T.	L-T	114.0	3.001	1.501	CT	1.566	1.41	85.70	70.7	15.9	1973	85034
		3.00			119.0	2.998	1.500	CT	1.556	1.22	83.10			1973	85034
		1.50			131.7	3.011	1.502	CT	1.573	0.50	58.90			1987	DA006
		1.50			131.7	3.011	1.502	CT	1.566	0.44	55.30			1987	DA006
ANNEALED	Forging	3.00	R.T.	T-L	118.0	3.003	1.500	CT	1.549	1.46	90.40	67.3	13.6	1973	85034
		3.00			120.0	3.001	1.494	CT	1.618	1.01	76.40			1973	85034
		3.00			140.1	3.007	1.495	CT	1.566	0.48	61.40			1987	DA007
		3.00			140.1	3.005	1.495	CT	1.558	0.52	63.60			1987	DA007
		1.50			144.9	3.010	1.506	CT	1.589	0.39	57.10			1987	DA006
		1.50			144.9	3.012	1.501	CT	1.625	0.36	54.70			1987	DA006

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} (K_{Ic} (Ksi * √in.)	K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED	Extrusion	1.75	-65	L-T	146.8	3.000	1.498	CT	1.571	0.71	78.20	75.9	2.4	1987	DA007
		1.75			146.8	3.010	1.497	CT	1.556	0.70	77.50			1987	DA007
		1.50			152.5	3.005	1.501	CT	1.422	0.57	72.90			1987	DA006
		1.50			152.5	3.007	1.510	CT	1.427	0.61	75.10			1987	DA006
ANNEALED	Extrusion	1.75	-65	T-L	149.2	3.000	1.498	CT	1.554	0.70	79.20	76.9	1.7	1987	DA007
		1.75			149.2	3.006	1.499	CT	1.598	0.67	77.10			1987	DA007
		1.50			157.2	3.007	1.504	CT	1.431	0.58	75.50			1987	DA006
		1.50			157.2	3.008	1.502	CT	1.425	0.58	75.90			1987	DA006
ANNEALED	Extrusion	4.00	R.T.	L-T	122.0	4.006	1.624	CT	2.027	1.42	92.00	82.6	5.3	1973	85836 (1)
		1.75			127.2	3.005	1.500	CT	1.589	1.00	80.60			1987	DA007
		1.75			127.2	3.007	1.500	CT	1.577	1.00	80.30			1987	DA007
		1.50			131.6	3.008	1.501	CT	1.637	0.93	80.20			1987	DA006
		1.50			131.6	3.007	1.502	CT	1.437	0.92	79.90			1987	DA006
ANNEALED	Extrusion	4.00	R.T.	T-L	122.0	4.003	1.629	CT	2.027	1.51	94.90	85.2	6.5	1973	85836 (1)
		4.00			122.0	4.005	1.625	CT	1.995	1.41	91.70			1973	85836 (1)
		1.75			127.9	3.005	1.500	CT	1.571	1.06	83.40			1987	DA007
		1.75			127.9	3.009	1.498	CT	1.627	1.02	81.80			1987	DA007
		1.50			131.4	2.007	1.502	CT	1.439	0.91	79.20			1987	DA006
		1.50			131.4	3.008	1.493	CT	1.465	0.93	80.30			1987	DA006
ANNEALED	Billet	6.00	R.T.	L-T	123.0	2.501	1.250	CT	1.249	0.87	72.80	79.6	9.6	1975	MA003
		6.00			123.0	2.500	1.251	CT	1.241	1.23	86.40			1975	MA003
ANNEALED 1000F 2 HR AC	Billet	2.30	R.T.	L-T	145.0	2.498	1.250	CT	1.264	0.30	50.50	50.9	0.6	1971	84360
		2.30			145.0	2.500	1.249	CT	1.250	0.31	51.30			1971	84360

NOTES: (1) COMPOSITION (WT PERCENT) 6.35Al, 4.31V, 0.22C, 0.16Fe, 0.09N, 0.06H, 0.16O

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 • $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi • $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED 1300F 4 HR AC	Forging	2.30	-65	L-T	145.0	1.500	0.750	CT	---	0.28	48.40	56.8	11.8	1974	89504
		2.30			145.0	1.500	0.750	CT	---	0.50	65.10			1974	89504
ANNEALED 1300F 4 HR AC	Forging	2.30	-65	T-L	151.0	1.500	0.750	CT	---	0.28	50.40	57.8	11.4	1974	89504
		2.30			151.0	1.500	0.750	CT	---	0.55	70.90			1974	89504
		2.30			151.0	1.500	0.750	CT	---	0.30	52.20			1974	89504
ANNEALED 1300F 4 HR AC	Forging	2.30	-65	S-T	146.0	1.500	0.750	CT	---	0.50	65.00	56.9	8.0	1974	89504
		2.30			146.0	1.500	0.750	CT	---	0.28	49.00			1974	89504
		2.30			146.0	1.500	0.750	CT	---	0.38	56.60			1974	89504
ANNEALED 1300F 4 HR AC	Forging	2.30	-65	S-L	146.0	1.500	0.750	CT	---	0.36	55.00	57.7	2.4	1974	89504
		2.30			146.0	1.500	0.750	CT	---	0.42	59.70			1974	89504
		2.30			146.0	1.500	0.750	CT	---	0.40	58.30			1974	89504
ANNEALED 1300F 4 HR AC	Forging	2.30	R.T.	L-T	129.0	1.500	0.750	CT	---	0.49	57.20	58.1	1.2	1974	89504
		2.30			129.0	1.500	0.750	CT	---	0.50	57.60			1974	89504
		2.30			129.0	1.500	0.750	CT	---	0.53	59.40			1974	89504
ANNEALED 1300F 4 HR AC	Forging	2.30	R.T.	T-L	132.0	1.500	0.750	CT	---	0.61	65.20	62.2	3.0	1974	89504
		2.30			132.0	1.500	0.750	CT	---	0.55	62.10			1974	89504
		2.30			132.0	1.500	0.750	CT	---	0.50	59.20			1974	89504
ANNEALED 1300F 4 HR AC	Forging	2.30	R.T.	S-T	128.0	1.500	0.750	CT	---	0.49	56.90	58.1	1.1	1974	89504
		2.30			128.0	1.500	0.750	CT	---	0.53	59.00			1974	89504
		2.30			128.0	1.500	0.750	CT	---	0.52	58.40			1974	89504

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED 1300F 4 HR AC	Forging	2.30	R.T.	S-L	128.0	1.500	0.750	CT	---	0.69	67.40	68.1	1.0	1974	89504
		2.30			128.0	1.500	0.750	CT	---	0.72	68.80			1974	89504
ANNEALED 1375F 3 HR AC	Plate	2.75	R.T.	L-T	129.0	2.499	1.250	CT	1.224	0.48	56.59	60.4	5.5	1975	MA003
		2.75			129.0	2.497	1.250	CT	1.200	0.62	64.30			1975	MA003
ANNEALED 2200F 2 HR	Forging	1.00	R.T.	---	140.0	2.000	1.000	CT	1.000	0.50	62.80	57.5	3.9	1974	88962 (1)
		1.00			140.0	2.000	1.000	CT	1.000	0.43	58.20			1974	88962 (1)
		1.00			140.0	2.000	1.000	CT	1.000	0.39	55.20			1974	88962 (1)
		1.00			140.0	2.000	1.000	CT	1.000	0.44	58.80			1974	88962 (1)
		1.00			140.0	2.000	1.000	CT	1.000	0.35	52.40			1974	88962 (1)
AS RECEIVED	Forged Bar	---	R.T.	L-T	124.0	2.000	1.002	CT	1.020	0.61	61.10	57.1	10.4	1974	90012
		---			126.0	2.006	1.000	CT	1.074	0.59	61.30			1974	90012
		3.50			126.0	1.998	1.001	CT	1.019	0.62	62.50			1974	90012
		1.80			126.0	1.997	0.625	CT	0.994	0.59	61.30			1974	90012
		3.50			129.0	1.996	1.002	CT	1.006	0.48	56.60			1974	90012
		---			130.0	1.998	1.000	CT	1.029	0.79	72.90			1974	90012
		---			130.0	2.000	1.000	CT	1.053	0.53	60.10			1974	90012
		3.50			131.0	1.998	0.998	CT	1.036	0.72	70.60			1974	90012
		1.30			134.0	2.000	0.563	CT	1.005	0.32	47.70			1974	90012
		---			134.0	1.998	1.003	CT	1.013	0.61	66.10			1974	90012
		1.50			136.0	1.998	1.003	CT	1.053	0.20	38.40			1974	90012
		2.50			137.0	2.000	0.999	CT	1.032	0.37	52.50			1974	90012
		2.60			137.0	2.001	1.000	CT	1.021	0.24	42.60			1974	90012
		2.70			143.0	2.001	0.999	CT	1.022	0.26	45.70			1974	90012

NOTES: (1) INTERMEDIATE GRAIN SIZE

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
AS RECEIVED	Forged Bar	3.50	R.T.	T-L	127.0	1.998	0.998	CT	1.064	0.68	66.40	54.9	10.8	1974	90012
		---			128.0	1.998	0.752	CT	1.023	0.42	52.50			1974	90012
		1.80			129.0	1.997	0.779	CT	1.018	0.66	66.50			1974	90012
		1.50			130.0	1.998	0.502	CT	1.000	0.41	52.60			1974	90012
		---			130.0	1.999	0.645	CT	0.998	0.43	54.00			1974	90012
		2.00			131.0	1.998	1.003	CT	1.023	0.53	60.10			1974	90012
		1.50			132.0	1.999	1.002	CT	1.055	0.16	33.80			1974	90012
		---			133.0	2.000	1.002	CT	1.027	0.69	69.90			1974	90012
		---			133.0	1.998	1.001	CT	1.024	0.50	59.40			1974	90012
		3.50			133.0	1.998	1.005	CT	1.045	0.56	62.70			1974	90012
		3.50			134.0	2.000	1.000	CT	1.028	0.58	64.50			1974	90012
		1.50			135.0	1.996	0.560	CT	0.994	0.45	57.40			1974	90012
		---			135.0	2.003	1.001	CT	1.023	0.46	57.80			1974	90012
		---			139.0	2.001	1.002	CT	1.016	0.44	58.20			1974	90012
		---			139.0	2.000	0.654	CT	1.010	0.37	53.50			1974	90012
		---			139.0	1.998	1.003	CT	1.033	0.35	52.10			1974	90012
		2.60			140.0	2.002	0.999	CT	1.014	0.14	32.80			1974	90012
		1.30			141.0	2.002	1.001	CT	1.033	0.18	37.40			1974	90012
		1.80			142.0	1.999	0.999	CT	1.048	0.36	53.70			1974	90012
		1.00			142.0	1.993	1.001	CT	1.054	0.55	66.80			1974	90012
		2.50			145.0	2.000	0.999	CT	1.028	0.19	40.10			1974	90012

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)² (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
AS RECEIVED-AB (ALPHA-BETA FORGED)	Forged Bar	3.50	R.T.	L-T	127.0	2.000	1.000	CT	1.023	0.92	77.10	---	---	1974	90012
AS RECEIVED-AB (ALPHA-BETA FORGED)	Forged Bar	3.50	R.T.	T-L	131.0	2.000	1.000	CT	1.023	0.95	80.90	---	---	1974	90012
B FORGED BETA FORGED REHEATED TO 1950F DRAWN TO SIZE ANNEALED 1300F	Forged Bar	2.25	R.T.	T-L	135.0	2.000	1.000	CT	1.046	0.30	46.80	42.6	4.3	1973	86688
		2.25			135.0	3.000	1.500	CT	1.471	0.20	37.80			1973	86688
		2.25			135.0	2.000	1.000	CT	1.038	0.28	45.60			1973	86688
		2.25			135.0	2.000	1.000	CT	1.058	0.22	40.20			1973	86688
B FORGED-MA BETA FORGED MILL ANNEALED 1300F 2 HR AC	Forging	2.75	R.T.	---	131.0	2.000	1.000	CT	1.000	0.88	77.70	75.3	3.4	1974	88962 (1)
		2.75			131.0	2.000	1.000	CT	1.000	0.77	72.90			1974	88962 (1)
B FORGED-MA BETA FORGED MILL ANNEALED 1300F 2 HR AC	Forging	2.00	R.T.	L-T	137.0	2.000	1.000	CT	---	0.59	66.40	70.6	4.9	1971	80538
		2.00			137.0	2.000	1.000	CT	---	0.77	76.00			1971	80538
		2.00			137.0	2.000	1.000	CT	---	0.64	69.30			1971	80538
B FORGED-MA BETA FORGED MILL ANNEALED 1300F 2 HR AC	Forging	2.00	R.T.	T-L	131.0	2.000	1.000	CT	---	0.73	70.60	71.0	0.4	1971	80538
		2.00			131.0	2.000	1.000	CT	---	0.74	71.10			1971	80538
		2.00			131.0	2.000	1.000	CT	---	0.74	71.40			1971	80538
B FORGED-MA BETA FORGED MILL ANNEALED 1300F 2 HR AC	Forging	2.00	R.T.	S-L	132.0	2.000	1.000	CT	---	0.74	72.10	73.9	2.5	1971	80538
		2.00			132.0	2.000	1.000	CT	---	0.82	75.70			1971	80538

NOTES: (1) COMP. DISK

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)^2 (in.)	K_{Ic} (K_{Ic} (Ksi * √in.))	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
BB AB FIN-30MA BETA BLOCKED ALPHA-BETA FINISHED 30% REDUCTION MILL ANNEALED 1300F 2 HR AC	Forging	2.50	R.T.	---	127.0	2.000	1.000	CT	1.000	1.00	80.50	78.2	3.3	1974	88962
		2.50			127.0	2.000	1.000	CT	1.000	0.89	75.90			1974	88962
BB AB FIN-MA BETA BLOCKED ALPHA-BETA FINISHED MILL ANNEALED	Forging	---	R.T.	---	132.0	2.500	1.250	CT	1.250	0.78	73.50	72.3	5.6	1973	90584 (1)
		---			132.0	2.500	1.250	CT	1.250	0.89	78.70			1973	90584 (1)
		---			134.0	2.500	1.250	CT	1.250	0.59	65.10			1973	90584 (1)
		---			134.0	2.500	1.250	CT	1.250	0.72	72.10			1973	90584 (1)
BB AB FIN-RA BETA BLOCKED ALPHA-BETA FINISHED RECRYSTALLIZED ANNEAL 1700F 4HR FC TO 1000F AC	Forging	---	R.T.	---	135.0	2.500	1.250	CT	1.250	0.89	80.70	75.1	4.3	1973	90584 (1)
		---			135.0	2.500	1.250	CT	1.250	0.76	74.40			1973	90584 (1)
		---			137.0	2.500	1.250	CT	1.250	0.74	74.80			1973	90584 (1)
		---			137.0	2.500	1.250	CT	1.250	0.66	70.30			1973	90584 (1)
BB AB FIN10STO BETA-BLOCKED ALPHA-BETA FINISHED 10% REDUCTION SOLUTION TREATED & OVERAGED 1750F 1HR WQ 1300F 2HR AC	Forging	2.50	R.T.	---	136.0	2.000	1.000	CT	1.000	0.84	79.00	81.7	3.4	1974	88962
		2.50			136.0	2.000	1.000	CT	1.000	0.99	85.50			1974	88962
		2.50			136.0	2.000	1.000	CT	1.000	0.88	80.50			1974	88962
BB AB FIN30STO BETA-BLOCKED ALPHA-BETA FINISHED 30% REDUCTION SOLUTION TREATED & OVERAGED 1750F 1 HR WQ 1300F 2HR AC	Forging	2.50	R.T.	---	137.0	2.000	1.000	CT	1.000	0.81	78.00	73.1	5.3	1974	88962
		2.50			137.0	2.000	1.000	CT	1.000	0.60	67.40			1974	88962
		2.50			137.0	2.000	1.000	CT	1.000	0.72	73.80			1974	88962

NOTES: (1) F-14 OUTBOARD COVER

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
BB B FIN-10MA BETA BLOCKED BETA FINISHED 10% REDUCTION MILL ANNEALED 1300F 2HR AC	Forging	2.50	R.T.	---	128.0	2.000	1.000	CT	1.000	0.85	74.50	73.3	1.9	1974	88962
		2.50			128.0	2.000	1.000	CT	1.000	0.84	74.40			1974	88962
		2.50			128.0	2.000	1.000	CT	1.000	0.77	71.10			1974	88962
BB B FIN10STOA BETA BLOCKED BETA FINISHED 10% REDUCTION SOLUTION TREATED & OVERAGED 1750F 1HR WQ 1300F 2HR AC	Forging	2.50	R.T.	---	138.0	2.000	1.000	CT	1.000	0.96	85.60	86.1	0.5	1974	88962
		2.50			138.0	2.000	1.000	CT	1.000	0.98	86.40			1974	88962
		2.50			138.0	2.000	1.000	CT	1.000	0.98	86.40			1974	88962
BETA ANNEALED	Plate	2.50	-65	L-T	125.0	4.003	1.991	CT	2.116	2.06	113.50	109.4	2.8	1974	88575
		2.50			125.0	4.005	2.000	CT	2.152	1.95	110.50			1974	88575
		2.50			125.0	3.997	2.001	CT	2.072	1.90	109.10			1974	88575
		2.50			125.0	4.003	1.998	CT	2.105	1.79	105.90			1974	88575
		2.50			125.0	4.009	2.005	CT	2.084	1.86	108.00			1974	88575
BETA ANNEALED	Plate	1.00	R.T.	T-L	126.0	2.550	1.000	WOL-CT EQ.	---	0.98	79.20	---	---	1977	JEM01
BETA ANNEALED PLATE EB WELDED THEN BETA ANNEALED, EB WELD IN PLANE OF FRACTURE	Plate	2.50	R.T.	---	116.0	1.994	0.999	CT	1.133	0.90	69.80	69.2	0.9	1974	88575
		2.50			116.0	1.992	0.951	CT	1.140	0.87	68.50			1974	88575
BETA PROCESSED MILL ANNEALED	Plate	3.00	R.T.	L-T	130.4	3.000	1.500	CT	---	1.44	99.00	94.9	4.8	1975	UD008
		3.00			130.4	3.000	1.500	CT	---	1.35	96.00			1975	UD008
		3.00			130.4	3.000	1.500	CT	---	1.18	89.60			1975	UD008

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)^2 (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
DIFFUSION BOND ANNEALED = 1750F 1.5-4HR FC TO 900F AT 100F/HR	Billet	3.50	R.T.	L-T	127.0	2.000	1.000	CT	1.072	0.93	77.50	68.2	9.7	1974	90012
		1.00			129.0	2.001	1.002	CT	1.092	0.98	80.70			1974	90012
		---			129.0	2.002	1.004	CT	1.032	0.75	70.80			1974	90012
		1.50			132.0	2.000	1.003	CT	1.019	0.45	56.10			1974	90012
		---			132.0	1.995	1.000	CT	1.083	0.83	76.30			1974	90012
		3.50			132.0	1.999	1.003	CT	1.029	0.68	69.00			1974	90012
		2.60			133.0	1.996	0.975	CT	1.017	0.48	58.10			1974	90012
		3.50			134.0	1.999	1.000	CT	1.030	0.69	70.40			1974	90012
		2.70			137.0	2.000	1.001	CT	1.024	0.40	54.70			1974	90012
DIFFUSION BOND ANNEALED = 1750F 1.5-4HR FC TO 900F AT 100F/HR	Billet	---	R.T.	T-L	125.0	1.997	0.676	CT	0.992	0.65	64.00	64.2	11.8	1974	90012
		---			125.0	2.000	1.003	CT	1.032	0.80	70.80			1974	90012
		---			128.0	2.001	0.999	CT	1.043	0.90	76.90			1974	90012
		3.50			131.0	1.995	1.000	CT	1.048	0.84	76.00			1974	90012
		3.50			132.0	1.998	0.999	CT	1.013	0.67	68.20			1974	90012
		2.00			133.0	1.998	1.000	CT	1.028	0.75	72.70			1974	90012
		3.50			133.0	2.000	0.999	CT	1.019	0.72	71.40			1974	90012
		1.50			134.0	2.000	1.000	CT	1.043	0.39	53.10			1974	90012
		---			135.0	2.000	1.001	CT	1.033	0.66	69.20			1974	90012
		2.50			137.0	1.998	0.877	CT	1.021	0.33	49.50			1974	90012
		2.60			138.0	1.997	0.979	CT	1.031	0.27	45.10			1974	90012
		2.70			140.0	2.000	1.004	CT	1.018	0.25	44.60			1974	90012
		1.00			142.0	2.001	1.000	CT	1.042	0.66	72.70			1974	90012

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Plate	0.62	R.T.	---	120.0	4.005	2.002	CT	1.966	1.47	92.10	---	---	1973	85836
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Plate	0.62	R.T.	L-T	120.0	3.004	1.500	CT	1.574	1.11	79.90	---	---	1973	85836
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Plate	0.62	R.T.	T-L	120.0	3.005	1.501	CT	1.575	1.20	83.10	---	---	1973	85836
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Plate	1.50	R.T.	S-T	120.0	4.000	1.500	CT	---	1.34	88.00	85.7	3.2	1974	89004
		1.50			120.0	4.000	1.500	CT	---	1.16	82.00			1974	89004
		1.50			120.0	4.000	1.500	CT	---	1.31	87.00			1974	89004
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Plate	2.50	R.T.	S-L	120.0	4.000	1.500	CT	---	1.14	81.00	---	---	1974	89004
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Billet	0.62	R.T.	L-T	120.0	3.000	1.500	CT	---	1.11	80.00	---	---	1974	89004
DIFFUSION BONDED - 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Billet	0.62	R.T.	T-L	120.0	3.000	1.500	CT	---	1.20	83.00	---	---	1974	89004

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)² (in.)	K_{Ic} (K_{Ic} (Ksi * √in.))	K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
DIFFUSION BONDED = 1700F 4HR FC TO 1400F AT 100F/HR THEN TO 900F IN 0.75HR	Billet	8.00	R.T.	S-T	---	3.995	1.495	CT	1.926	1.32	87.40	88.0	3.6	1972	84306
		8.00			---	3.999	1.457	CT	1.881	1.18	82.40			1972	84306
		8.00			---	3.998	1.495	CT	1.920	1.33	87.80			1972	84306
		8.00			---	3.998	1.495	CT	1.963	1.43	90.90			1972	84306
		8.00			---	3.998	1.492	CT	1.969	1.45	91.60			1972	84306
MA 10-20%ALPHA 10 TO 20% PRIMARY ALPHA MILL ANNEALED 1300F 2 HR AC	Forging	2.50	R.T.	---	141.0	2.000	1.000	CT	1.000	0.67	73.10	69.4	3.2	1974	88962
		2.50			141.0	2.000	1.000	CT	1.000	0.58	68.00			1974	88962
		2.50			141.0	2.000	1.000	CT	1.000	0.57	67.10			1974	88962
MA 40-50%ALPHA 40 TO 50% PRIMARY ALPHA MILL ANNEALED 1300F 2 HR AC	Forging	2.50	R.T.	---	135.0	2.000	1.000	CT	1.000	0.70	71.50	69.1	3.4	1974	88962
		2.50			135.0	2.000	1.000	CT	1.000	0.68	70.60			1974	88962
		2.50			135.0	2.000	1.000	CT	1.000	0.58	65.20			1974	88962
MA COARSE GRAIN 1300F 2 HR AC	Forging	14.00	R.T.	---	139.0	2.000	1.000	CT	1.000	0.40	55.30	53.9	2.0	1974	88962
		14.00			139.0	2.000	1.000	CT	1.000	0.36	53.20			1974	88962
		14.00			139.0	2.000	1.000	CT	1.000	0.35	52.20			1974	88962
		14.00			139.0	2.000	1.000	CT	1.000	0.42	56.70			1974	88962
		14.00			139.0	2.000	1.000	CT	1.000	0.35	52.10			1974	88962
MA FINE GRAIN 1300F 2 HR AC	Forging	6.00	R.T.	---	138.0	2.000	1.000	CT	1.000	0.85	80.60	69.5	7.7	1974	88962
		6.00			138.0	2.000	1.000	CT	1.000	0.76	76.10			1974	88962
		6.00			138.0	2.000	1.000	CT	1.000	0.46	59.60			1974	88962
		6.00			138.0	2.000	1.000	CT	1.000	0.62	69.10			1974	88962
		6.00			138.0	2.000	1.000	CT	1.000	0.60	67.60			1974	88962
		6.00			138.0	2.000	1.000	CT	1.000	0.54	64.00			1974	88962

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 \cdot (K_{Ic}/TYS)^2$ (in.)	K_{Ic} (K_{Ic} (Ksi • √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
MILL ANNEAL	Plate	1.50	R.T.	L-T	133.0	2.496	1.244	CT	1.330	0.45	56.59	55.6	1.3	1981	MA002
		1.50			133.0	2.502	1.255	CT	1.297	0.42	54.70			1981	MA002
MILL ANNEAL	Plate	1.00	R.T.	T-L	146.1	2.550	1.000	WOL-CT EQ.	---	0.17	38.20	---	---	1977	JEM01
MILL ANNEALED	Plate	2.00	-65	T-L	157.0	4.000	2.004	CT	1.970	1.03	89.70	87.9	2.0	1973	88144
		2.00			157.0	4.000	2.002	CT	1.980	0.94	85.70			1973	88144
		2.00			157.0	4.000	2.003	CT	1.990	0.99	88.20			1973	88144
MILL ANNEALED	Plate	2.00	R.T.	L-T	127.0	4.000	2.003	CT	2.137	1.94	112.00	---	---	1972	85064
MILL ANNEALED	Plate	1.25	R.T.	T-L	119.4	3.495	1.245	CT	1.741	1.16	95.30	100.6	6.8	1972	84306
		1.25			119.4	3.499	1.245	CT	1.824	1.20	97.00			1972	84306
		1.25			119.4	3.500	1.247	CT	1.817	1.15	94.80			1972	84306
		2.00			126.0	4.000	2.002	CT	2.038	1.53	98.70			1972	85064
		2.00			126.0	4.000	2.001	CT	2.097	1.94	112.00			1972	85064
		2.00			126.0	4.000	2.002	CT	2.048	1.75	105.50			1972	85064
MILL ANNEALED	Extrusion	4.00	R.T.	L-T	123.5	3.997	1.465	CT	1.957	1.21	87.60	83.5	3.1	1972	84306 (1)
		1.80			124.0	3.934	1.578	CT	2.031	1.17	85.09			1976	NC001
		1.80			124.0	3.930	1.578	CT	2.036	1.12	83.06			1976	NC001
		1.80			124.5	3.995	1.577	CT	2.049	1.09	82.37			1976	NC001
		1.80			124.5	3.995	1.578	CT	2.115	1.01	79.17			1976	NC001

NOTES: (1) COMPOSITION (WT PERCENT) 6.51Al, 4.86V, 0.024C, 0.19Fe, 0.012V, 0.006H, 0.15O

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 \cdot (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi $\cdot \sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
MILL ANNEALED	Extrusion	4.00	R.T.	T-L	---	4.000	1.496	CT	1.947	1.30	92.50	87.5	4.1	1972	84306 (1)
		4.00			---	4.000	1.496	CT	2.084	1.29	92.10			1972	84306 (1)
		1.80			125.5	3.995	1.575	CT	2.102	1.06	81.82			1976	NC001
		1.80			125.5	3.995	1.577	CT	2.113	1.21	87.42			1976	NC001
		1.80			127.0	3.995	1.578	CT	2.096	1.13	85.71			1976	NC001
		1.80			127.0	3.938	1.577	CT	2.079	1.13	85.64			1976	NC001
MILL ANNEALED 1300F 2 HR AC	Forging	2.00	R.T.	L-T	132.0	2.000	1.000	CT	---	0.30	45.40	47.7	2.9	1971	80538
		2.00			132.0	2.000	1.000	CT	---	0.31	46.70			1971	80538
		2.00			132.0	2.000	1.000	CT	---	0.37	51.00			1971	80538
MILL ANNEALED 1300F 2 HR AC	Forging	2.00	R.T.	T-L	133.0	2.000	1.000	CT	---	0.30	46.50	49.5	3.9	1971	80538
		2.00			133.0	2.000	1.000	CT	---	0.41	53.90			1971	80538
		2.00			133.0	2.000	1.000	CT	---	0.32	48.00			1971	80538
MILL ANNEALED 1300F 2 HR AC	Forging	2.00	R.T.	S-L	140.0	2.000	1.000	CT	---	0.31	49.50	43.6	5.8	1971	80538
		2.00			140.0	2.000	1.000	CT	---	0.18	37.90			1971	80538
		2.00			140.0	2.000	1.000	CT	---	0.24	43.50			1971	80538
MILL ANNEALED 1300F 2 HR AC	Billet	2.30	R.T.	L-T	120.0	2.500	1.250	CT	1.277	1.13	80.30	84.0	3.4	1971	84360
		2.30			127.0	2.498	1.251	CT	1.225	1.11	85.00			1971	84360
		2.30			127.0	2.500	1.253	CT	1.271	1.16	86.80			1971	84360
MILL ANNEALED 1300F 2HR AC	Forging	4.50	R.T.	L-T	130.0	2.498	1.248	CT	1.355	0.54	60.59	---	---	1981	MA002
RECRYSTALLIZE ANNEAL	Plate	1.50	-65	L-T	---	3.999	1.502	CT	2.044	0.63	60.40	---	---	1972	84306 (2)
RECRYSTALLIZE ANNEAL	Plate	1.50	-65	T-L	---	3.997	1.496	CT	2.110	1.03	77.00	---	---	1972	84306 (2)

NOTES: (1) COMPOSITION (WT PERCENT) 6.35Al, 4.31V, 0.22C, 0.16Fe, 0.09N, 0.06H, 0.16O
(2) 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR	Plate	1.50	R.T.	L-T	118.0	4.005	1.502	CT	2.004	1.08	79.00	82.8	7.8	1972	84306
		1.50			118.0	4.003	1.502	CT	2.021	0.97	74.90			1972	84306
		2.00			119.0	6.002	1.780	CT	3.075	1.64	97.30			1972	84306
		2.00			119.0	6.003	1.873	CT	3.138	1.62	96.60			1972	84306
		2.50			120.0	4.000	2.000	CT	---	0.95	74.00			1974	89004
		1.50			120.0	4.000	1.501	CT	2.103	1.16	81.80			1973	85836
		1.25			120.0	---	1.250	CT	---	1.08	79.00			1974	89004
		2.50			120.0	2.999	1.126	CT	1.526	0.83	69.00			1973	85836
		1.25			120.0	---	1.250	CT	---	1.03	77.00			1974	89004
		2.50			120.0	---	---	CT	---	1.38	89.00			1974	89004
		1.25			120.0	---	1.250	CT	---	0.98	75.00			1974	89004
		2.50			120.0	---	---	CT	---	1.31	87.00			1974	89004
		1.25			120.0	---	1.250	CT	---	0.92	73.00			1974	89004
		2.50			120.0	4.000	2.000	CT	---	1.17	82.00			1974	89004
		1.25			120.0	---	1.250	CT	---	1.14	81.00			1974	89004
		1.50			120.0	6.000	1.370	CT	---	1.11	80.00			1974	89004
		2.50			120.0	4.000	2.000	CT	---	1.11	80.00			1974	89004
		1.50			121.0	6.002	1.496	CT	3.080	1.44	91.00			1972	84306
		1.50			121.0	3.500	1.500	CT	---	1.44	92.00			1974	89004
		1.50			121.0	6.003	1.500	CT	3.103	1.30	86.60			1972	84306
		1.50			121.0	6.001	1.497	CT	3.065	1.41	90.20			1972	84306
		1.50			121.0	3.500	1.500	CT	---	1.29	87.00			1974	89004

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR	Plate	2.50	R.T.	T-L	120.0	3.000	1.108	CT	1.520	0.83	69.30	80.8	10.8	1973	85836
		1.25			120.0	---	1.250	CT	---	0.92	73.00			1974	89004
		2.50			120.0	4.000	2.000	CT	---	1.25	85.00			1974	89004
		1.25			120.0	---	1.250	CT	---	1.00	76.00			1974	89004
		2.50			120.0	4.000	2.000	CT	---	0.83	69.00			1974	89004
		2.50			120.0	---	---	CT	---	1.50	93.00			1974	89004
		2.00			120.0	6.001	2.009	CT	3.048	1.97	106.40			1973	85836
		1.25			120.0	---	1.250	CT	---	0.95	74.00			1974	89004
		1.50			120.0	6.000	1.370	CT	---	1.28	86.00			1974	89004
		1.50			120.0	4.001	1.498	CT	2.131	1.45	91.50			1973	85836
		1.25			120.0	---	1.250	CT	---	1.14	81.00			1974	89004
		2.50			120.0	4.000	2.000	CT	---	0.98	75.00			1974	89004
		1.50			120.0	3.000	1.500	CT	---	1.25	85.00			1974	89004
		2.50			120.0	---	---	CT	---	1.44	91.00			1974	89004
		2.50			120.0	3.000	1.127	CT	1.544	0.90	71.90			1973	85836
		2.00			120.0	5.999	1.997	CT	3.056	1.79	101.50			1973	85836
		2.50			120.0	2.999	1.374	CT	1.534	0.84	69.40			1973	85836
		2.50			120.0	---	---	CT	---	1.14	81.00			1974	89004
		1.25			120.0	---	1.250	CT	---	0.85	70.00			1974	89004
		2.50			120.0	4.000	2.000	CT	---	1.00	76.00			1974	89004
		1.50			121.0	3.500	1.500	CT	---	1.18	83.00			1974	89004
		1.00			135.0	2.550	1.000	WOL-CT EQ.	---	0.65	69.20			1977	JEM01(1)

NOTES: (1) TYS APPROX. 120

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} (K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR	Forging	---	R.T.	L-T	---	3.000	1.500	CT	---	1.03	77.00	83.6	5.5	1974	89004
		---			---	4.000	2.020	CT	---	1.20	83.00			1974	89004
		---			---	3.000	1.500	CT	---	0.92	73.00			1974	89004
		---			---	4.000	1.790	CT	---	1.06	78.00			1974	89004
		2.25			114.0	2.997	1.499	CT	1.528	1.43	86.10			1973	85034
		2.25			115.0	2.999	1.500	CT	1.524	1.49	89.00			1973	85034
		2.25			116.0	2.998	1.499	CT	1.535	1.30	83.60			1973	85034
		3.40			117.0	2.999	1.503	CT	1.554	1.47	89.70			1973	85034
		2.25			117.0	3.002	1.500	CT	1.539	1.05	76.00			1973	85034
		5.62			118.0	3.004	1.499	CT	1.540	1.46	90.30			1973	85034
		2.25			118.0	2.999	1.499	CT	1.526	1.19	81.30			1973	85034
		5.62			119.0	3.008	1.497	CT	1.536	1.46	90.90			1973	85034
		2.20			119.0	3.007	1.498	CT	1.563	1.49	91.90			1973	85857
		2.20			119.0	3.005	1.500	CT	1.552	1.36	87.80			1973	85857
		3.40			119.0	3.002	1.501	CT	1.533	1.39	88.90			1973	85034
		2.20			120.0	3.006	1.505	CT	1.581	1.41	90.10			1973	85857
		6.70			121.0	3.000	1.502	CT	1.541	0.96	75.10			1973	85034
		1.20			121.0	3.004	1.376	CT	1.615	1.22	84.40			1973	85857
		1.20			121.0	3.005	1.374	CT	1.588	1.27	86.10			1973	85857

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)² (in.)	K_{Ic} (K_{Ic} (Ksi * √in.))	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR Cont'd	Forging Cont'd	1.20	R.T. Cont'd	L-T Cont'd	121.0	3.010	1.345	CT	1.556	1.15	82.10	Cont'd	Cont'd	1973	85857
		6.70			121.0	3.001	1.500	CT	1.548	1.06	78.70			1973	85034
		2.20			121.0	3.003	1.502	CT	1.589	1.17	82.80			1973	85857
		2.20			121.0	3.002	1.504	CT	1.555	1.24	85.10			1973	85857
		2.20			122.0	3.003	1.499	CT	1.633	1.18	83.90			1973	85857
		1.20			122.0	3.009	1.318	CT	1.583	1.12	81.70			1973	85857
		1.50			123.0	2.998	1.417	CT	1.593	0.95	75.70			1973	85034
		1.20			123.0	3.006	1.377	CT	1.605	1.17	84.30			1973	85857
		1.50			123.0	3.002	1.377	CT	1.578	0.80	73.20			1973	85034
		2.20			124.0	3.003	1.501	CT	1.607	1.16	84.40			1973	85857
		1.50			124.0	3.004	1.409	CT	1.577	0.94	76.00			1973	85034
		3.20			124.0	3.001	1.504	CT	1.583	1.49	95.70			1973	85857
		1.50			124.0	2.999	1.397	CT	1.585	0.98	77.80			1973	85034
		2.50			124.0	3.005	1.504	CT	1.549	1.08	81.50			1973	85034
		1.20			125.0	3.001	1.375	CT	1.612	1.14	84.60			1973	85857
		2.20			126.0	3.003	1.495	CT	1.591	1.11	83.80			1973	85857
		1.50			127.0	3.001	1.248	CT	1.542	1.17	86.70			1973	85857
		1.50			127.0	3.003	1.250	CT	1.527	1.24	89.50			1973	85857
		1.50			127.0	3.001	1.250	CT	1.583	1.20	88.00			1973	85857
		1.50			129.0	2.999	1.248	CT	1.588	1.07	84.40			1973	85857
		1.50			129.0	2.999	1.249	CT	1.440	1.08	84.80			1973	85857
		1.50			130.0	3.002	1.372	CT	1.560	0.92	78.80			1973	85034

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 \cdot (K_{Ic}/TYS)^2$ (in.)	K_{Ic} (K_{Ic} (Ksi $\cdot \sqrt{in.}$))	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR	Forging	---	R.T.	T-L	---	3.500	1.750	CT	---	1.31	87.00	83.9	6.9	1974	89004 (1)
		---			---	3.000	1.500	CT	---	1.03	77.00			1974	89004 (1)
		---			---	3.000	1.500	CT	---	0.85	70.00			1974	89004 (1)
		---			---	3.500	1.750	CT	---	1.40	90.00			1974	89004 (1)
		3.40			116.0	3.000	1.502	CT	1.544	1.36	85.70			1973	85034
		5.62			117.0	3.001	1.500	CT	1.537	1.24	82.50			1973	85034
		6.70			118.0	2.997	1.501	CT	1.578	1.32	85.80			1973	85034
		3.40			119.0	3.002	1.500	CT	1.545	1.27	84.90			1973	85034
		5.62			119.0	3.001	1.500	CT	1.543	1.18	81.80			1973	85034
		3.50			120.0	3.007	1.502	CT	1.574	1.35	88.40			1973	85857
		5.62			120.0	2.997	1.499	CT	1.518	1.03	77.00			1973	85034
		5.62			120.0	3.005	1.498	CT	1.520	1.25	84.70			1973	85034
		1.50			121.0	3.004	1.250	CT	1.573	1.11	80.20			1973	85857
		6.70			121.0	3.002	1.500	CT	1.546	0.81	68.80			1973	85034
		1.50			122.0	3.000	1.245	CT	1.475	1.20	84.80			1973	85857
		1.50			122.0	3.000	1.248	CT	1.547	0.96	75.50			1973	85857
		3.40			123.0	2.998	1.497	CT	1.493	0.82	70.40			1973	85034
		6.70			123.0	3.000	1.501	CT	1.544	1.33	89.60			1973	85034
		4.75			123.0	3.004	1.502	CT	1.558	1.11	82.00			1973	85034
		3.50			123.0	2.998	1.500	CT	1.530	1.32	89.20			1973	85034
		2.20			124.0	3.002	1.502	CT	1.572	1.24	87.30			1973	85857
		6.70			124.0	2.996	1.502	CT	1.501	1.12	83.00			1973	85034

NOTES: (1) TYS APPROX. 120

TABLE 6.16.2.1 (CONTINUED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 \cdot (K_{Ic}/TYS)^2$ (in.)	K_{Ic} (K_{Ic} (Ksi $\cdot \sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR Cont'd	Forging Cont'd	4.75	R.T. Cont'd	T-L Cont'd	125.0	3.001	1.502	CT	1.541	1.24	87.90	Cont'd	Cont'd	1973	85034
		2.20			125.0	3.006	1.498	CT	1.593	1.03	80.30			1973	85857
		3.20			126.0	3.000	1.508	CT	1.589	1.30	90.70			1973	85857
		2.25			126.0	2.998	1.500	CT	1.516	1.02	80.50			1973	85034
		2.25			126.0	2.995	1.502	CT	1.535	1.31	91.30			1973	85034
		3.20			126.0	3.000	1.501	CT	1.521	1.47	96.50			1973	85857
		2.20			127.0	3.008	1.502	CT	1.733	1.38	94.40			1973	85857
		2.20			127.0	3.002	1.500	CT	1.577	1.03	81.40			1973	85857
		2.25			127.0	3.001	1.500	CT	1.552	1.34	93.10			1973	85034
		2.20			128.0	3.006	1.500	CT	1.601	0.88	75.90			1973	85857
		1.50			128.0	3.002	1.398	CT	1.595	0.97	79.70			1973	85034
		1.50			129.0	3.003	1.424	CT	1.583	0.83	74.20			1973	85034
		1.50			129.0	3.001	1.377	CT	1.575	0.85	75.40			1973	85034
		1.50			129.0	3.000	1.367	CT	1.586	1.02	82.20			1973	85034
		1.50			129.0	2.999	1.355	CT	1.586	1.11	85.90			1973	85034
		1.50			130.0	3.001	1.368	CT	1.564	1.16	88.60			1973	85034
		1.20			130.0	3.004	1.347	CT	1.587	1.26	92.50			1973	85857
		1.50			130.0	3.004	1.399	CT	1.587	0.99	81.70			1973	85034
		1.20			130.0	3.008	1.344	CT	1.653	1.27	92.60			1973	85857
		2.25			130.0	3.000	1.500	CT	1.522	1.32	94.50			1973	85034
		1.20			130.0	3.010	1.319	CT	1.649	1.22	90.80			1973	85857
		2.20			131.0	3.006	1.497	CT	1.592	0.95	80.60			1973	85857

TABLE 6.16.2.1 (CONCLUDED)

TITANIUM Ti-6Al-4V K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR Cont'd	Forging Cont'd	1.20	R.T. Cont'd	T-L Cont'd	131.0	3.005	1.375	CT	1.599	0.85	76.30	Cont'd	Cont'd	1973	85857
		1.50			132.0	3.000	1.409	CT	1.583	0.81	75.00			1973	85034
		1.20			133.0	3.006	1.374	CT	1.577	0.86	77.90			1973	85857
		1.20			134.0	3.009	1.380	CT	1.625	1.15	91.00			1973	85857
		2.25			134.0	2.998	1.499	CT	1.537	1.04	86.50			1973	85034
		1.20			136.0	3.007	1.377	CT	1.585	1.08	89.60			1973	85857
RECRYSTALLIZE ANNEAL = 1700F 4HR FC TO 1400F AT 100F/HR COOL TO 900F IN .75HR	Forging	---	R.T.	S-L	---	3.000	1.500	CT	---	1.20	83.00	88.9	3.2	1974	89004 (1)
		4.60			118.0	3.003	1.428	CT	1.559	1.42	89.30			1973	85634
		6.70			121.0	3.001	1.502	CT	1.552	1.46	92.50			1973	85034
		4.75			122.0	3.000	1.500	CT	1.573	1.37	90.20			1973	85034
		6.70			122.0	3.000	1.502	CT	1.540	1.40	91.10			1973	85034
		4.60			122.0	3.001	1.500	CT	1.540	1.26	86.70			1973	85634
		6.70			122.0	2.999	1.501	CT	1.532	1.37	90.40			1973	85034
		4.75			124.0	3.002	1.502	CT	1.544	1.37	91.70			1973	85034
		6.70			125.0	3.001	1.501	CT	1.543	1.17	85.60			1973	85034
STA	Plate	0.62	R.T.	T-L	160.0	3.503	0.634	CT	1.801	0.18	43.50	42.6	2.0	1973	85836
		0.62			160.0	3.501	0.632	CT	1.790	0.19	44.00			1973	85836
		0.62			160.0	3.503	0.633	CT	1.831	0.16	40.30			1973	85836
STA	Forging	2.00	R.T.	---	126.9	---	2.000	---	---	1.32	92.32	---	---	---	RI005
STOA	Forging	2.00	R.T.	---	132.0	---	2.000	---	---	1.00	83.52	---	---	---	RI005
STOA 1750F 1 HR WQ 1300F 2 HR AC	Forging	2.50	R.T.	---	142.0	2.000	1.000	CT	1.000	0.44	59.80	59.4	2.3	1974	88962
		2.50			142.0	2.000	1.000	CT	1.000	0.47	61.40			1974	88962
		2.50			142.0	2.000	1.000	CT	1.000	0.40	56.90			1974	88962

NOTES: (1) TYS APPROX. 120

TABLE 6.16.2.2

TI-6AL-4V K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} ($K_{si}\sqrt{in.}$)	K_{app} MEAN	K_{app} STAN DEV	K_C ($K_{si}\sqrt{in.}$)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES NOT RESTRAINED																			
1300F 1HR AC	Forging	---	R.T.	L-T	147.1	5.970	0.382	2.020	3.180	---	51.90	99.57	101.1	2.2	141.72	144.4	3.7	1964	58782
		---			147.1	5.970	0.382	2.020	3.200	---	53.50	102.64			146.98			1964	58782
1300F 1HR AC	Forging	---	R.T.	L-T	147.1	8.970	0.732	3.000	5.000	---	54.40	126.94	---	---	190.38*	---	---	1964	58782
1300F 1HR AC	Forging	---	R.T.	L-T	147.1	8.970	0.998	3.000	5.200	---	28.30	66.05	---	---	103.28	---	---	1964	58782
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED	Sheet	0.04	-109	L-T	163.0	8.000	0.040	2.000	---	---	73.60	135.72	121.4	7.0	---	---	---	1963	54304
		0.04			163.0	8.000	0.040	1.040	---	---	94.10	121.54			---			1963	54304
		0.04			163.0	8.000	0.040	0.850	---	---	101.00	117.52			---			1963	54304
		0.04			163.0	8.000	0.040	1.540	---	---	77.20	122.89			---			1963	54304
		0.04			163.0	8.000	0.040	3.060	---	---	47.40	114.42			---			1963	54304
		0.04			163.0	8.000	0.040	4.840	---	---	33.60	121.50			---			1963	54304
		0.04			163.0	8.000	0.040	4.440	---	---	35.30	116.22			---			1963	54304
ANNEALED	Sheet	0.04	R.T.	L-T	137.3	8.000	0.040	1.550	---	---	95.50	152.56*	143.2	4.3	---	---	---	1963	54304
		0.04			137.3	8.000	0.040	3.030	---	---	61.20	146.71			---			1963	54304
		0.04			137.3	8.000	0.040	2.020	---	---	78.60	145.78			---			1963	54304
		0.04			137.3	8.000	0.040	0.950	---	---	108.30	133.46*			---			1963	54304
		0.04			137.3	8.000	0.040	4.050	---	---	47.50	143.18			---			1963	54304

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 6.16.2.2 (CONTINUED)

TI-6AL-4V K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{max}	K_{app} ($K_{si}\sqrt{in.}$)	K_{app} MEAN	K_{app} STAN DEV	K_C ($K_{si}\sqrt{in.}$)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED Cont'd	Sheet Cont'd	0.04	R.T. Cont'd	L-T Cont'd	137.3	8.000	0.040	5.030	---	---	36.20	137.12	Cont'd	Cont'd	---	Cont'd	Cont'd	1963	54304
		0.04			137.3	8.000	0.040	0.480	---	---	126.00	109.65*			---			1963	54304
ANNEALED	Sheet	0.04	550	L-T	96.7	8.000	0.040	2.020	---	---	80.50	149.31*	---	---	---	---	---	1963	54304
		0.04			96.7	8.000	0.040	1.260	---	---	91.00	130.02*			---			1963	54304
		0.04			96.7	8.000	0.040	0.570	---	---	101.20	96.06*			---			1963	54304
		0.04			96.7	8.000	0.040	0.950	---	---	94.90	116.95*			---			1963	54304
		0.04			96.7	8.000	0.040	0.250	---	---	111.20	69.73*			---			1963	54304
BUCKLING OF CRACK EDGES UNKNOWN																			
MA	Plate	0.25	R.T.	L-T	130.0	9.630	0.280	3.800	5.220	25.60	51.70	140.00	---	---	182.38*	---	---	1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	9.630	0.286	5.780	6.860	18.70	37.80	148.60	---	---	187.79*	---	---	1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	9.630	0.293	1.920	---	36.50	85.10	151.52*	---	---	---	---	---	1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	16.120	0.260	8.020	10.580	31.30	45.10	189.99	---	---	256.45*	---	---	1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	16.120	0.275	3.990	6.100	31.10	67.50	175.67	---	---	229.56*	---	---	1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	16.110	0.285	12.93	13.550	11.30	15.40	125.65	---	---	142.95	---	---	1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	18.000	0.265	4.540	---	53.90	75.30	209.36	210.8	2.1	---	---	---	1971	83984
		0.25			130.0	18.000	0.265	4.640	---	35.60	75.40	212.33			---			1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	32.160	0.262	6.020	---	39.20	75.20	236.38	---	---	---	---	---	1971	83984

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 6.16.2.2 (CONTINUED)

TI-6AL-4V K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{max}	K_{app} ($K_{si}\sqrt{in.}$)	K_{app} MEAN	K_{app} STAN DEV	K_C ($K_{si}\sqrt{in.}$)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES UNKNOWN																			
MA	Plate	0.25	R.T.	L-T	130.0	32.150	0.270	12.72	17.000	33.40	47.00	233.00	212.5	23.3	295.74	257.3	54.3	1971	83984
		0.25			130.0	32.140	0.273	19.20	21.700	14.20	26.20	187.15			218.88			1971	83984
		0.25			130.0	32.130	0.275	8.010	---	30.60	58.90	217.31			---			1971	83984
MA	Plate	0.25	R.T.	L-T	130.0	32.160	0.288	8.070	---	40.20	55.40	205.27	---	---	---	---	---	1971	83984
BUCKLING OF CRACK EDGES RESTRAINED																			
MA	Sheet	0.05	R.T.	L-T	136.5	24.070	0.047	10.00	---	---	41.60	184.97	167.0	12.8	---	196.4	19.9	1964	57573
		0.05			133.8	24.020	0.048	6.000	6.550	51.80	52.10	166.39			175.22			1964	57573
		0.05			136.5	23.900	0.049	5.990	---	---	47.30	150.98			---			1964	57573
		0.05			136.5	24.060	0.049	6.000	10.500	43.60	49.60	158.39			228.95			1964	57573
		0.05			136.5	24.060	0.049	6.000	---	---	60.70	193.83			---			1964	57573
		0.05			136.5	23.990	0.050	6.000	---	---	47.50	151.72			---			1964	57573
		0.05			133.8	24.050	0.050	6.000	---	41.30	51.50	164.46			---			1964	57573
		0.05			136.5	24.060	0.050	3.000	---	---	78.80	172.72			---			1964	57573
		0.05			136.5	24.070	0.050	6.000	---	---	56.60	180.74			---			1964	57573
		0.05			136.7	24.070	0.050	6.000	---	---	53.20	169.88			---			1964	57573
		0.05			136.7	24.070	0.052	6.010	7.350	41.10	51.80	165.57			186.87			1964	57573
		0.05			136.7	24.070	0.052	6.010	8.750	43.80	51.40	164.29			207.75			1964	57573
		0.05			136.0	24.080	0.054	6.000	8.120	38.40	47.00	150.08			180.69			1964	57573
		0.05			136.0	24.080	0.055	6.010	8.170	45.90	51.50	164.60			198.79			1964	57573

TABLE 6.16.2.2 (CONCLUDED)

TI-6AL-4V K_C																			
CONDITION HEAT TREAT	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN		CRACK LENGTH		GROSS STRESS		K_{app}			K_C			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	INIT (in.) $2a_o$	FINAL (in.) $2a_f$	ONSET (Ksi) σ_o	MAX (Ksi) σ_{max}	K_{app} (Ksi√in.)	K_{app} MEAN	STAN DEV	K_C (Ksi√in.)	K_C MEAN	STAN DEV		
BUCKLING OF CRACK EDGES RESTRAINED																			
MA	Sheet	0.20	R.T.	L-T	129.3	24.060	0.212	6.000	---	---	81.00	258.66*	---	---	---	---	---	1964	57573
		0.20			129.3	24.070	0.212	3.010	---	---	93.10	204.41*			---			1964	57573
		0.20			129.3	24.070	0.212	6.010	---	65.60	70.60	225.66			---			1964	57573
MA	Sheet	0.20	R.T.	L-T	129.3	24.070	0.218	6.000	---	---	76.40	243.96	244.9	1.3	---	---	---	1964	57573
		0.20			129.3	24.080	0.220	10.00	---	---	55.30	245.86			---			1964	57573
MA	Sheet	0.05	R.T.	L-T	136.7	24.370	0.052	5.990	---	---	54.20	172.73	---	---	---	---	---	1964	57573
MA	Sheet	0.05	82	L-T	136.5	24.070	0.051	5.990	7.100	43.30	47.50	151.53	---	---	167.72	---	---	1964	57573
MA	Sheet	0.05	-110	T-L	163.3	8.000	0.050	1.980	3.130	35.00	84.70	155.28	144.2	10.0	207.78*	159.4	7.5	1964	57573
		0.05			163.3	8.010	0.050	1.970	2.540	72.50	77.30	141.29			164.74			1964	57573
		0.05			164.3	8.010	0.052	1.920	2.370	66.60	75.50	135.97			154.07			1964	57573
MA	Sheet	0.03	R.T.	T-L	127.0	8.040	0.025	1.980	2.600	61.20	75.60	138.54	---	---	163.45*	---	---	1964	57573
MA	Sheet	0.05	R.T.	T-L	136.0	8.010	0.052	2.000	2.220	90.00	95.30	175.72*	---	---	186.89*	---	---	1964	57573
MA	Sheet	0.13	R.T.	T-L	139.7	8.050	0.127	1.980	2.740	48.00	103.70	190.02*	---	---	231.93*	---	---	1964	57573
MA	Sheet	0.03	650	T-L	80.2	8.030	0.025	2.060	2.460	75.70	77.70	145.73*	---	---	162.23*	---	---	1964	57573
MA	Sheet	0.05	650	T-L	81.7	8.020	0.051	2.000	2.090	63.40	75.40	139.01*	---	---	142.64*	---	---	1964	57573

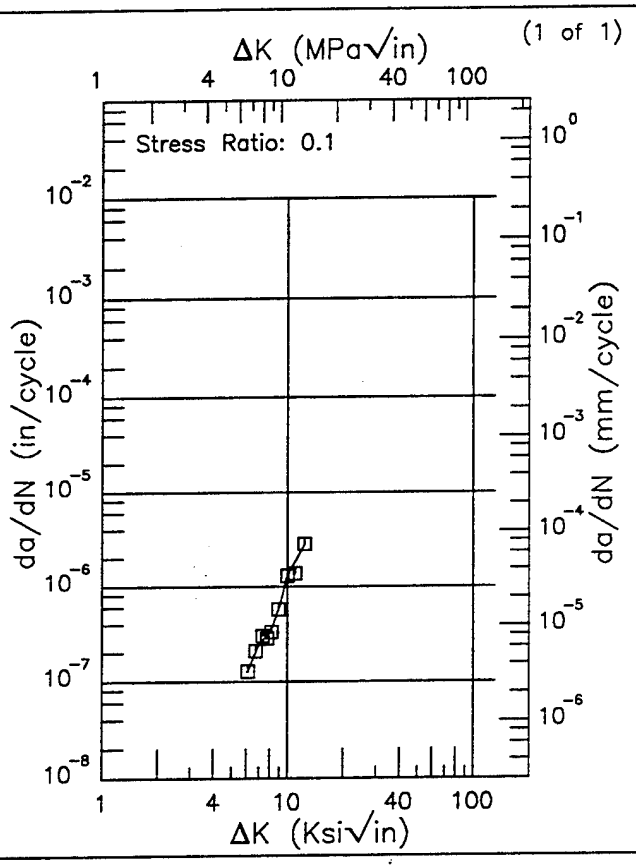
* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

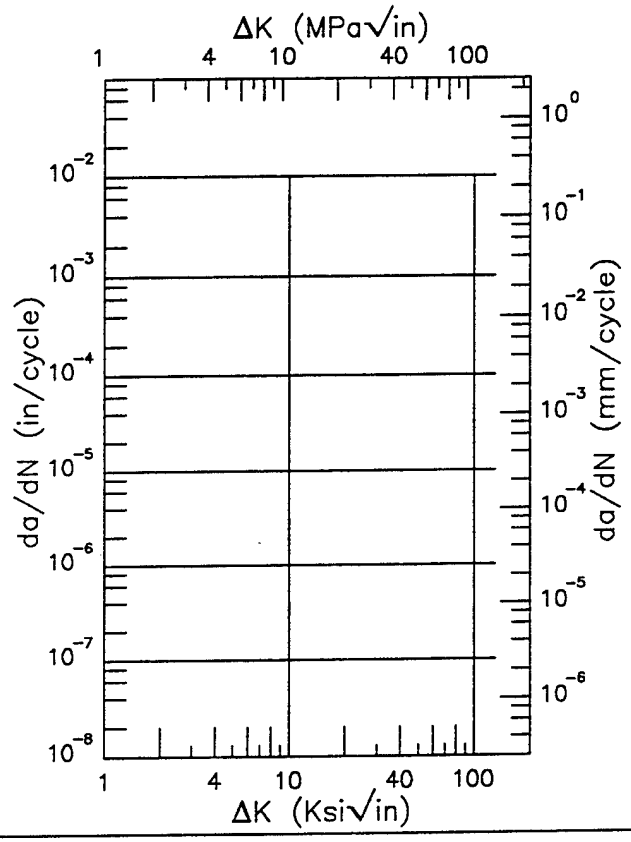
Ti-6Al-4V

R

Condition/Ht:
Form:
Specimen Type:
Orientation:
Frequency: 30 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.081 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.09 (min)	0.125
7.	0.242
8.	0.328
9.	0.601
10.	1.33
12.31 (max)	2.80

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
10.38	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.1

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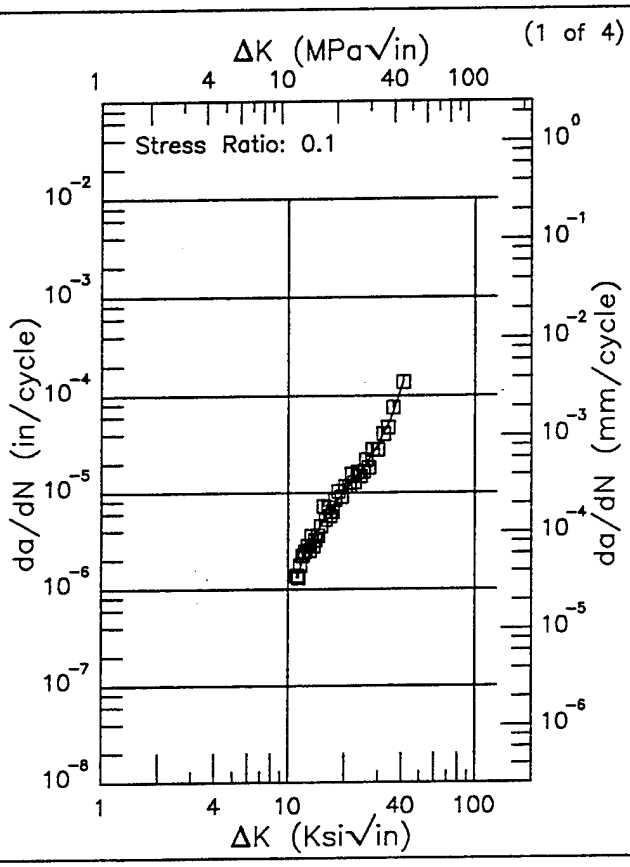
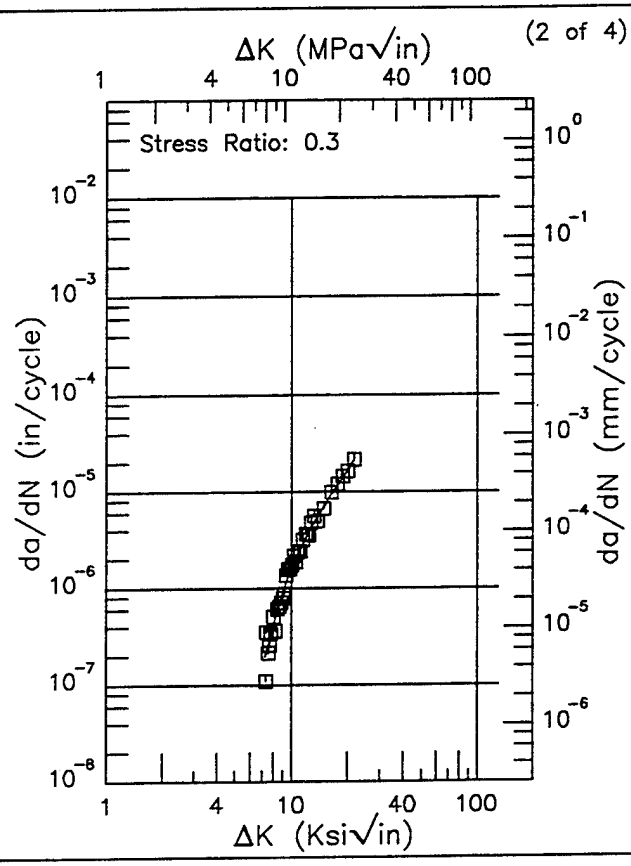
R

Ti–6Al–4V

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.28 – 0.299 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.07 (min)	1.31
13.	2.86
16.	5.86
20.	10.4
25.	17.8
30.	31.2
35.	58.9
40.	121.
41.03 (max)	142.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.27 (min)	0.198
8.	0.403
9.	0.898
10.	1.66
13.	4.48
16.	8.73
20.	16.3
21.70 (max)	21.2

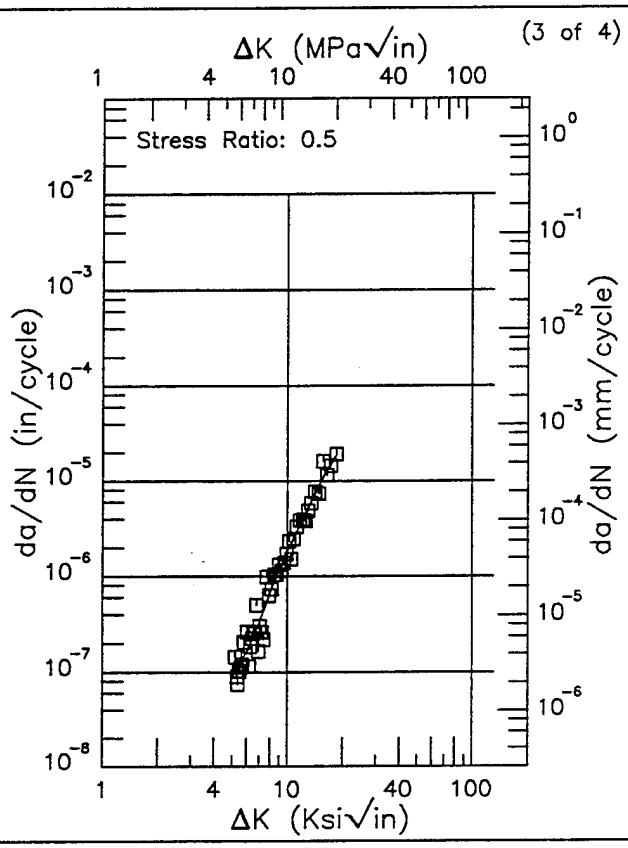
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
12.87	0. .5 .8 1.25 2.	17.18	0. .5 .8 1.25 2.

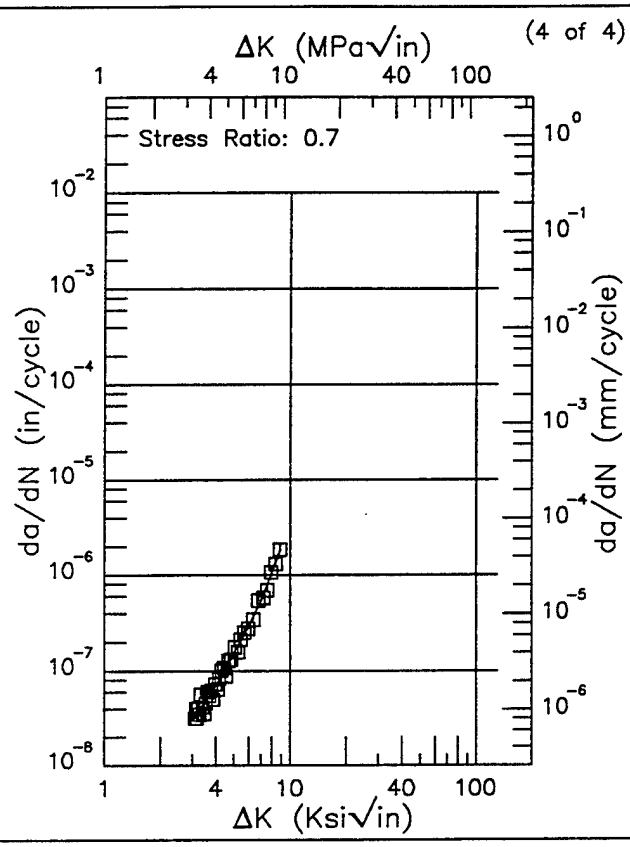
Figure 6.16.3.1.2

Ti–6Al–4V R

Condition/Ht:
Form:
Specimen Type: CT
Orientation: C–R
Frequency: 20 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.28 – 0.299 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.18 (min)	0.102
6.	0.161
7.	0.333
8.	0.664
9.	1.16
10.	1.82
13.	5.28
16.	12.3
18.26 (max)	18.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.07 (min)	0.0347
3.5	0.0467
4.	0.0702
5.	0.154
6.	0.295
7.	0.545
8.	1.04
8.80 (max)	1.82

RMS % Error	Life Prediction Ratio Summary
28.66	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
12.39	0. .5 .8 1.25 2.

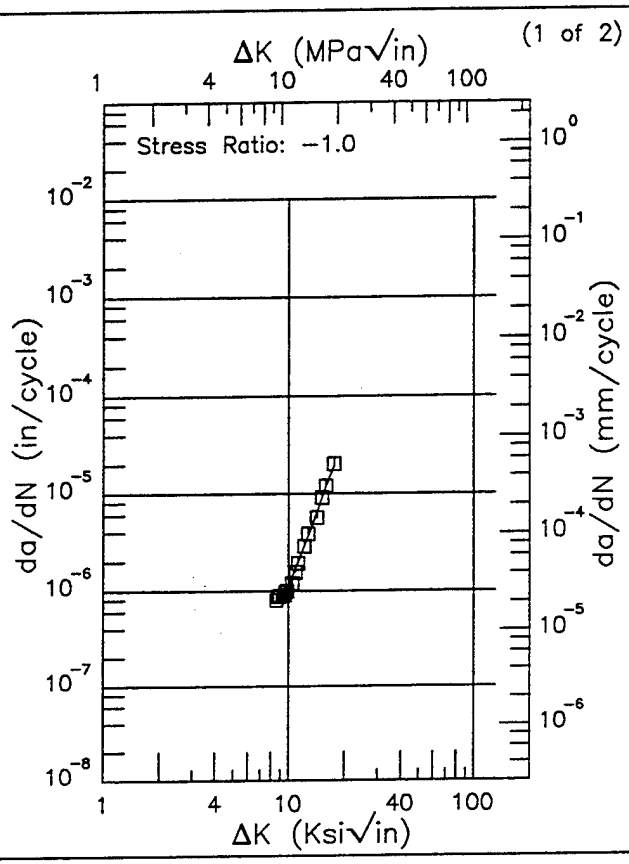
Figure 6.16.3.1.2 (Concluded)

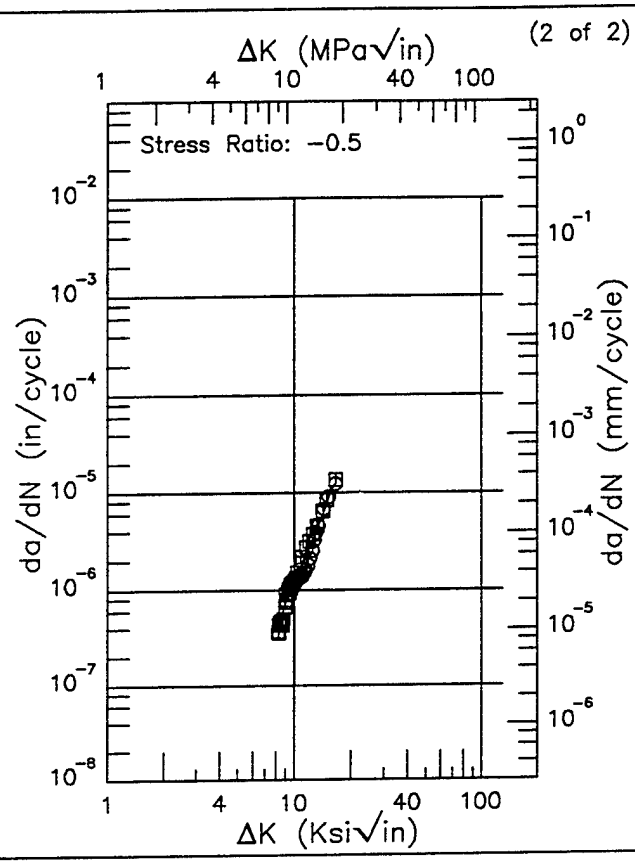
R

Ti–6Al–4V

Condition/Ht:
Form:
Specimen Type: CCP (max load specified)
Orientation: C–R
Frequency: 0.2 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.299 – 0.301 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.55 (min)	0.783
9.	0.847
10.	1.14
13.	3.96
16.	12.5
17.54 (max)	19.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.19 (min)	0.314
9.	0.783
10.	1.21
13.	3.67
16.	11.1
16.57 (max)	12.2

RMS % Error	Life Prediction Ratio Summary
6.59	0. .5 .8 1.25 2.

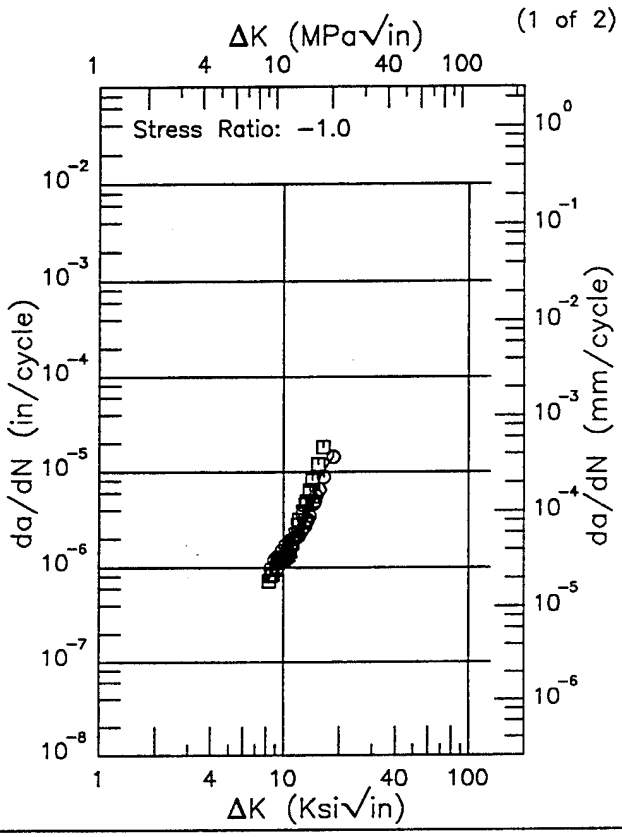
RMS % Error	Life Prediction Ratio Summary
15.36	0. .5 .8 1.25 2.

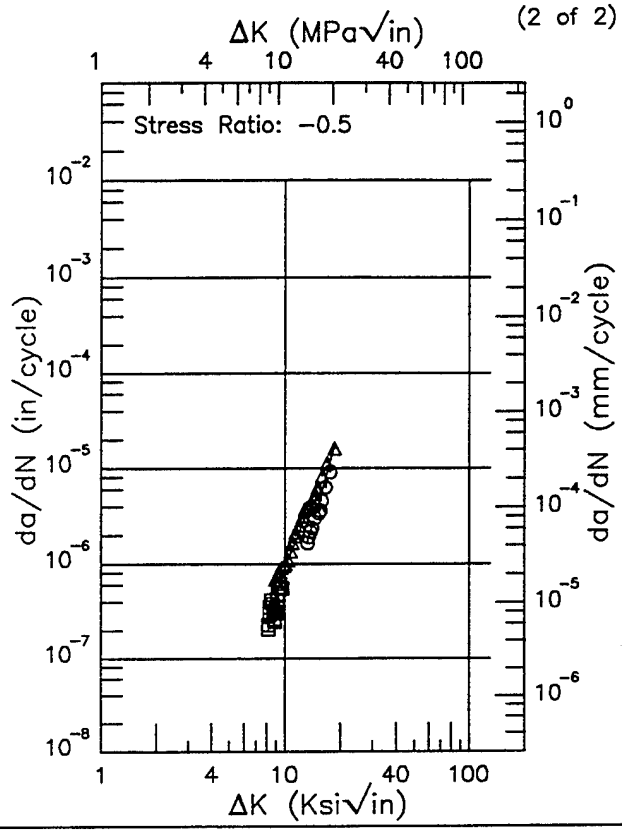
Figure 6.16.3.1.3

Ti–6Al–4V R

Condition/Ht:
Form:
Specimen Type: CCP (max load specified)
Orientation: C–R
Frequency: 0.2 Hz
Environment: LAB AIR;300°F

Yield Strength:
Ult. Strength:
Specimen Thk: 0.297 – 0.302 in.
Specimen Width: 2.5 in.
Ref: PW003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.26 (min)	0.752
9.	1.03
10.	1.32
13.	3.51
16.	9.52
18.42 (max)	14.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.12 (min)	0.242
9.	0.473
10.	0.912
13.	3.21
16.	5.81
18.48 (max)	16.4

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
22.59	0. .5 .8 1.25 2.	27.78	0. .5 .8 1.25 2.

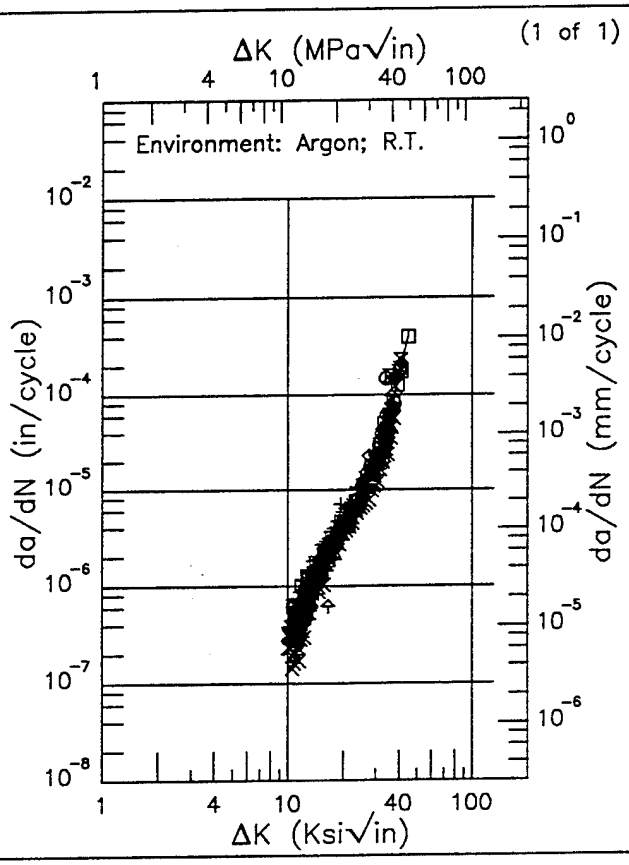
Figure 6.16.3.1.4

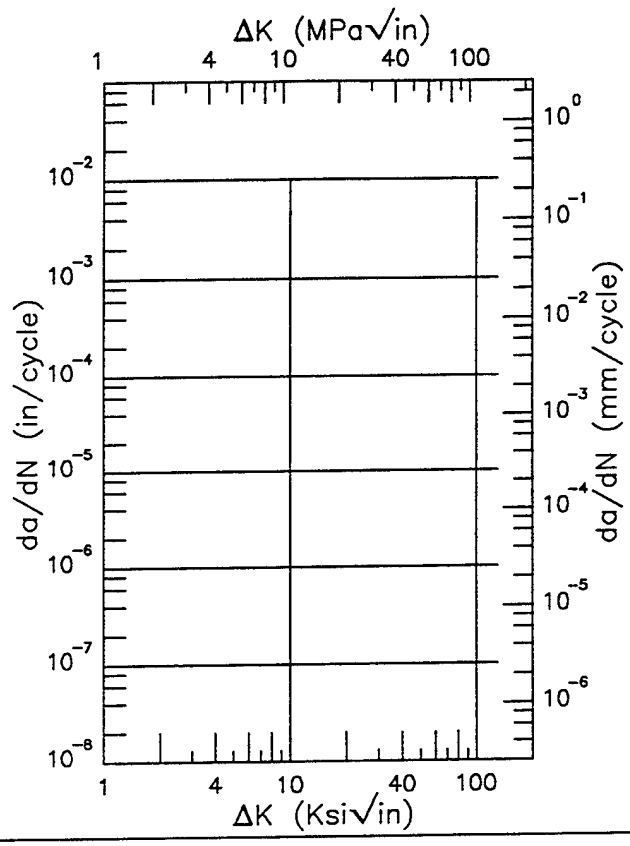
Ti–6Al–4V

E

Condition/Ht: 1550F 4HRS FC 1000F 4HRS ARGON COOLED
Form: Forging
Specimen Type: WOL
Orientation: R–C
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 140.9 ksi
Ult. Strength: 150.1 ksi
Specimen Thk: 0.8 in.
Specimen Width: 2.55 in.
Ref: UM001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.00 (min)	0.241
13.	0.805
16.	1.96
20.	4.31
25.	8.49
30.	17.3
35.	46.0
40.	166.
44.83 (max)	390.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
30.58	0. .5 .8 1.25 2.

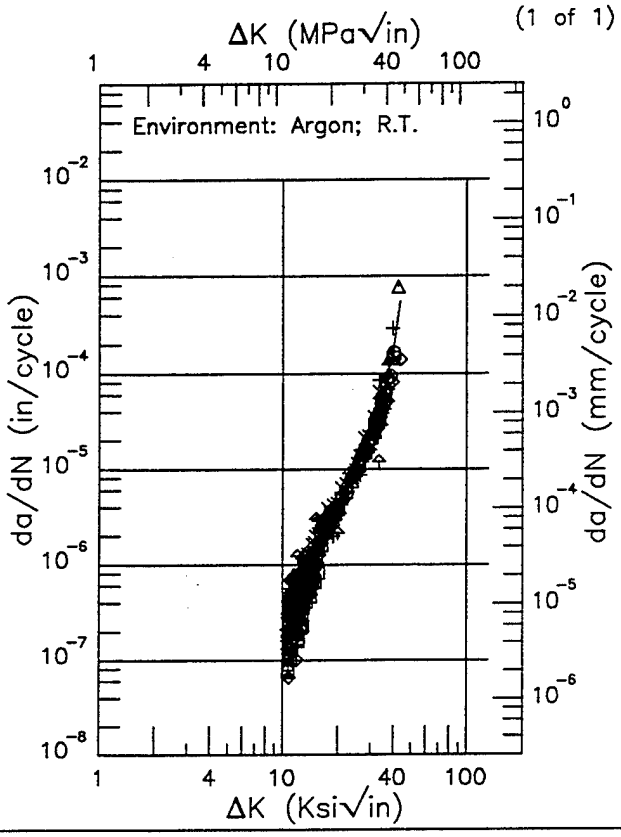
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

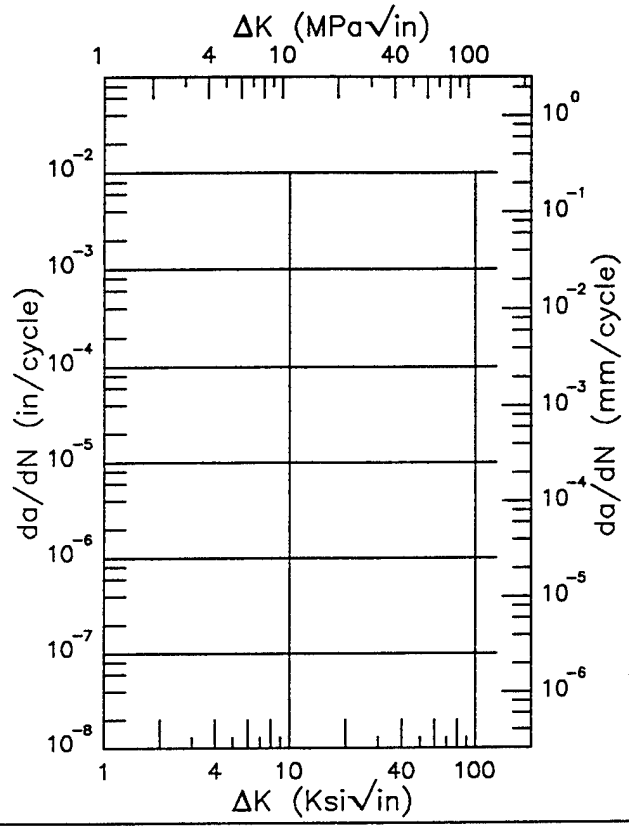
Figure 6.16.3.1.5

Ti–6Al–4V E

Condition/Ht: 1750F 4HRS ARGON COOLED
Form: Forging
Specimen Type: WOL
Orientation: R–C
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 135.7 ksi
Ult. Strength: 144.9 ksi
Specimen Thk: 0.8 in.
Specimen Width: 2.55 in.
Ref: UM001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.46 (min)	0.190
13.	0.613
16.	1.70
20.	4.38
25.	9.53
30.	19.8
35.	50.4
40.	176.
43.64 (max)	553.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
43.72	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

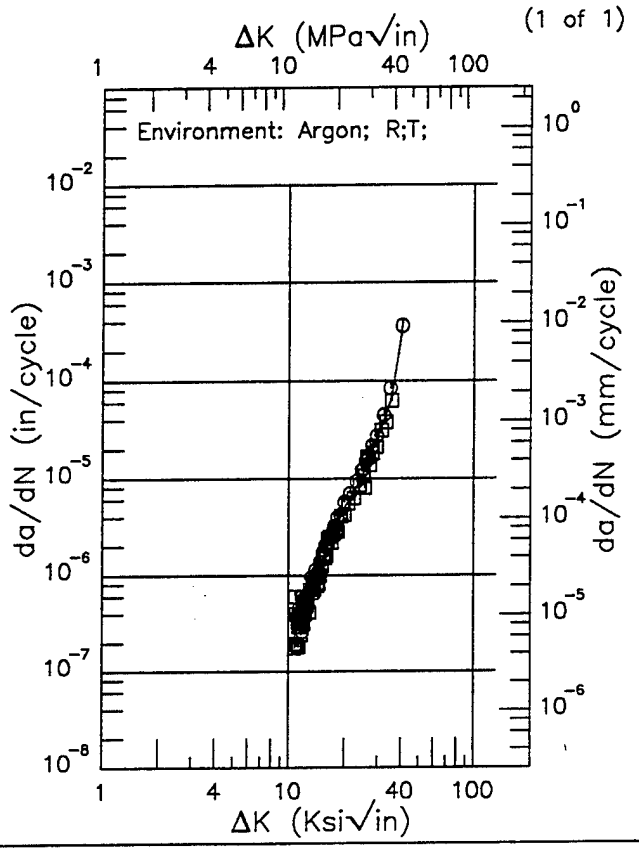
Figure 6.16.3.1.6

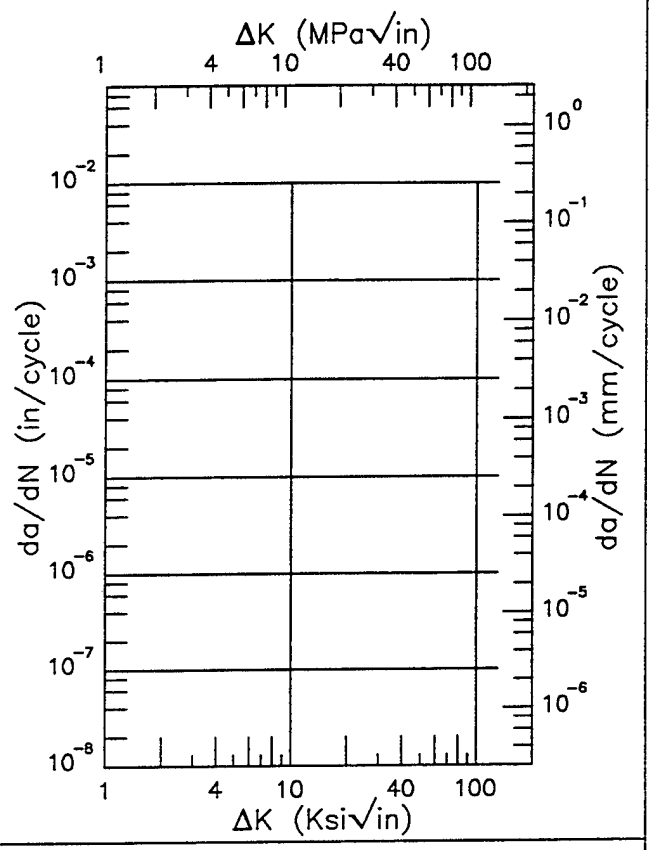
Ti–6Al–4V

E

Condition/Ht: 1750F. 4HRS ARGON COOLED
Form: Forging
Specimen Type: WOL
Orientation: C–R
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 135.7 ksi
Ult. Strength: 144.9 ksi
Specimen Thk: 0.8 in.
Specimen Width: 2.55 in.
Ref: UM001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.71 (min)	0.294
13.	0.615
16.	1.84
20.	5.00
25.	11.1
30.	26.1
35.	63.1
40.	296.
40.42 (max)	360.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
21.49	0. .5 .8 1.25 2.

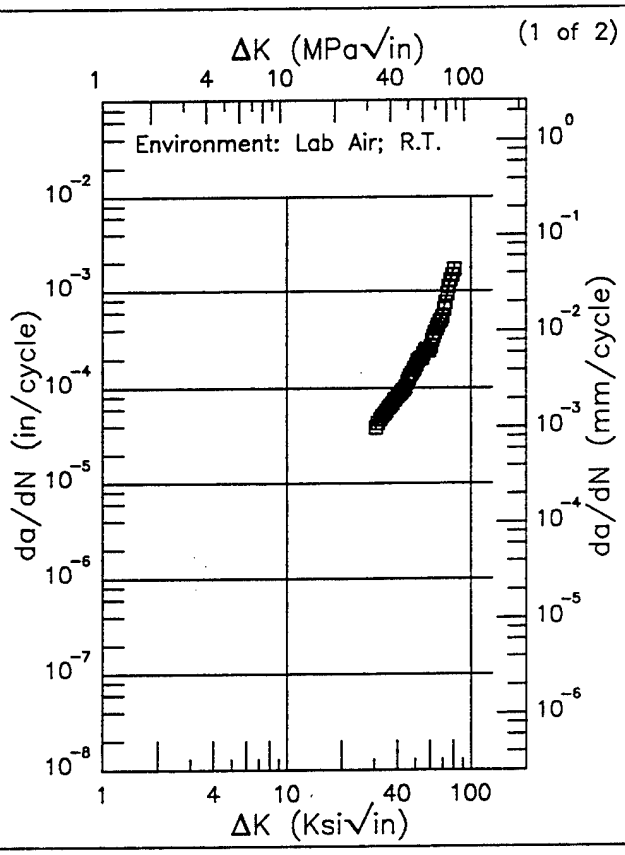
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

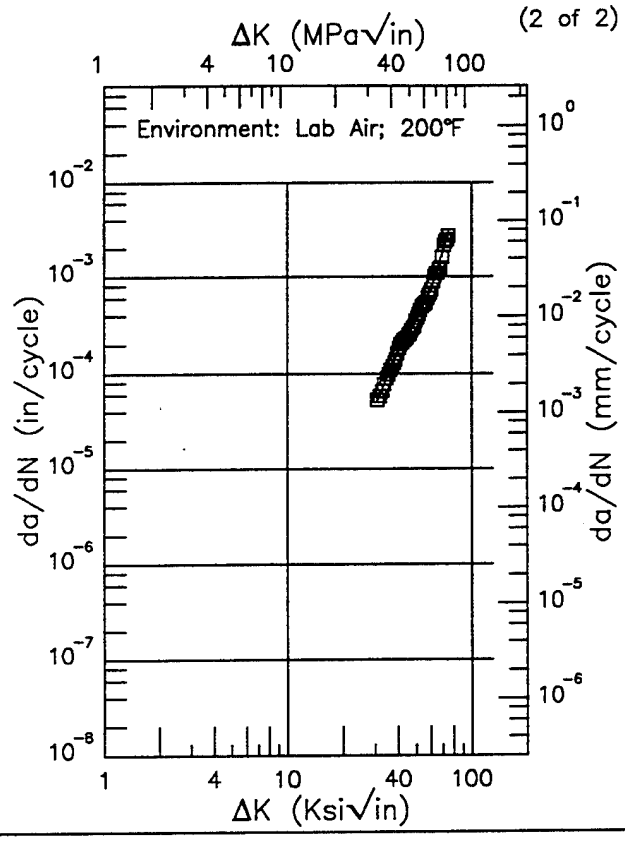
Figure 6.16.3.1.7

Ti–6Al–4V E

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F 4HR AC
Form: 0.5 in. Disk
Specimen Type: CCP (max load specified)
Orientation: C–R
Stress Ratio: 0.05
Frequency: 0.3 – 10 Hz

Yield Strength: 120 ksi
Ult. Strength: 130 ksi
Specimen Thk: 0.12 in.
Specimen Width: 1.98 in.
Ref: GE003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
30.47 (min)	38.7
35.	57.9
40.	80.3
50.	162.
60.	286.
70.	590.
80.	1635.
80.58 (max)	1718.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
30.79 (min)	50.8
35.	94.7
40.	168.
50.	357.
60.	737.
70.	1832.
74.44 (max)	2860.

RMS % Error	Life Prediction Ratio Summary
3.86	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
5.23	0. .5 .8 1.25 2.

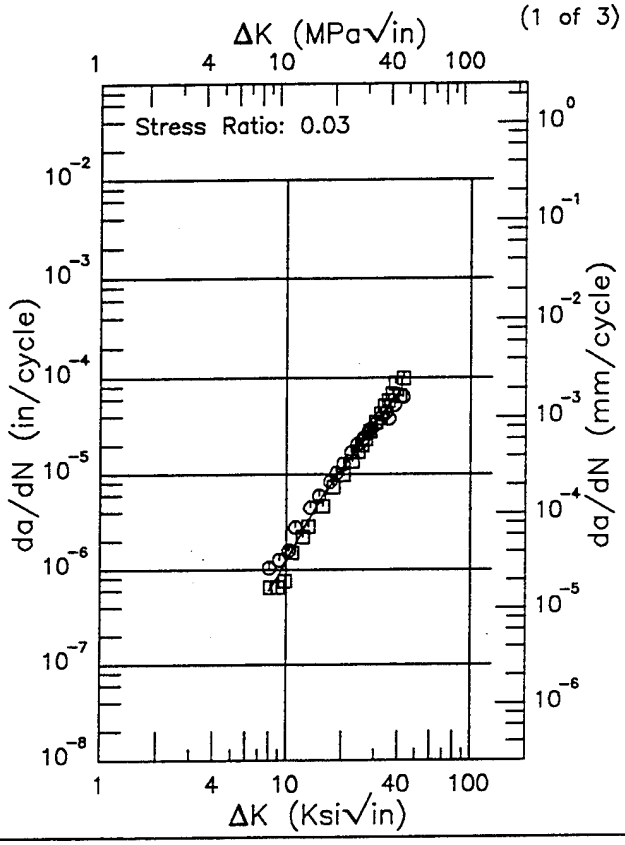
Figure 6.16.3.1.8

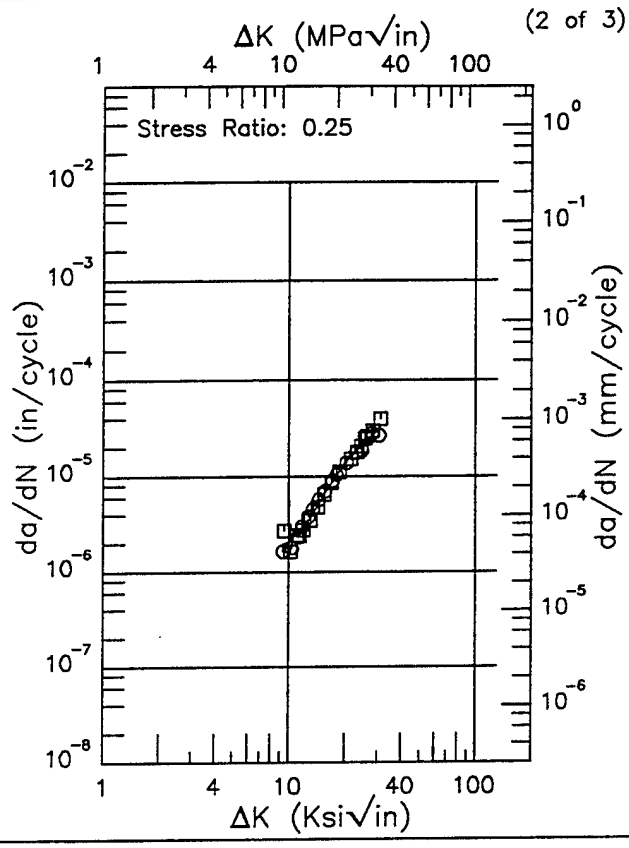
Ti–6Al–4V

R

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 – 1.15 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;600°F

Yield Strength: 145 – 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.253 in.
Specimen Width: 0.995 – 1.002 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.01 (min)	0.600
9.	0.864
10.	1.24
13.	3.17
16.	6.31
20.	11.5
25.	19.7
30.	32.2
35.	51.2
40.	68.1
42.82 (max)	65.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.28 (min)	1.96
10.	2.06
13.	3.61
16.	7.04
20.	13.7
25.	21.5
30.	30.1
30.82 (max)	31.9

RMS % Error	Life Prediction Ratio Summary
22.00	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
12.30	0. .5 .8 1.25 2.

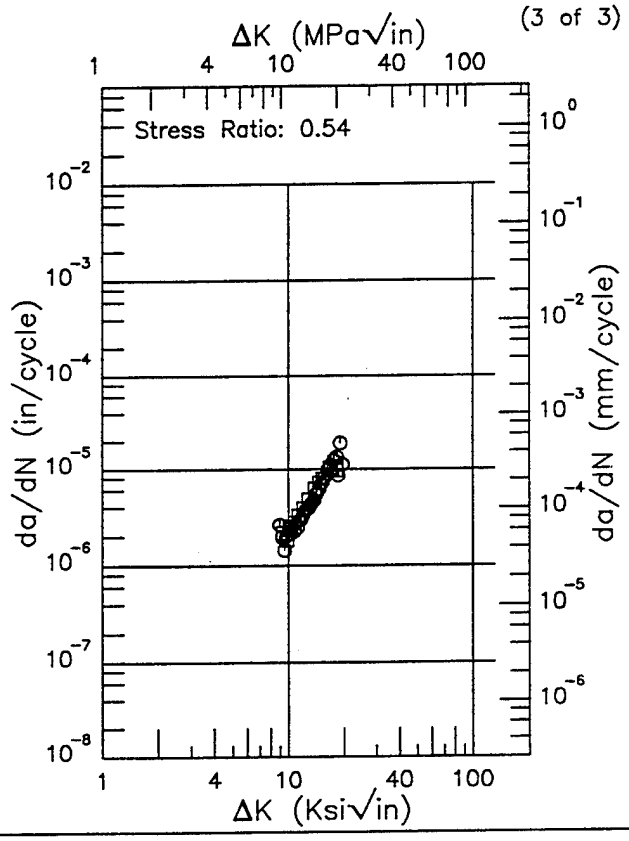
Figure 6.16.3.1.9

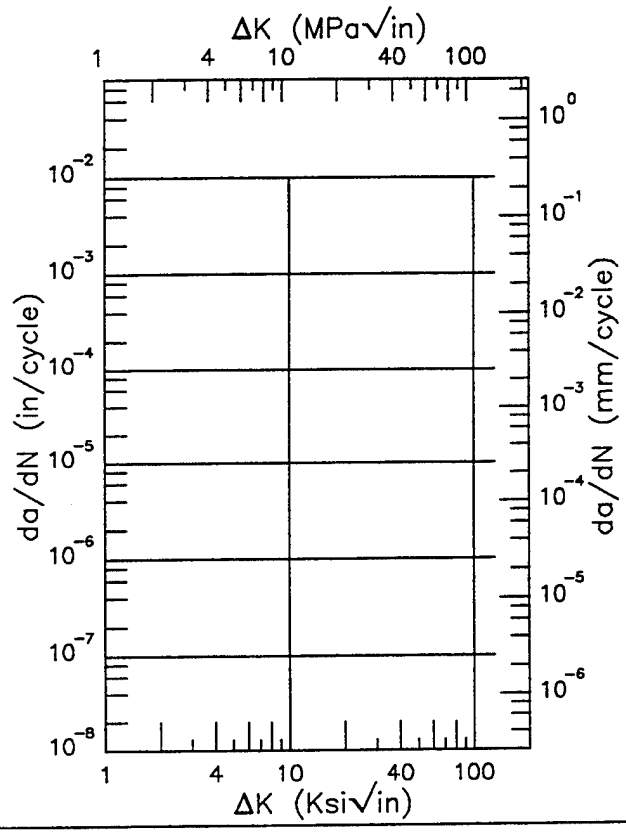
Ti–6Al–4V R

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 – 1.15 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;600°F

Yield Strength: 145 – 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.253 in.
Specimen Width: 0.995 – 1.002 in.
Ref: GE007

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.94 (min)	1.96
9.	1.96
10.	2.12
13.	4.38
16.	8.94
19.48 (max)	13.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
14.60	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

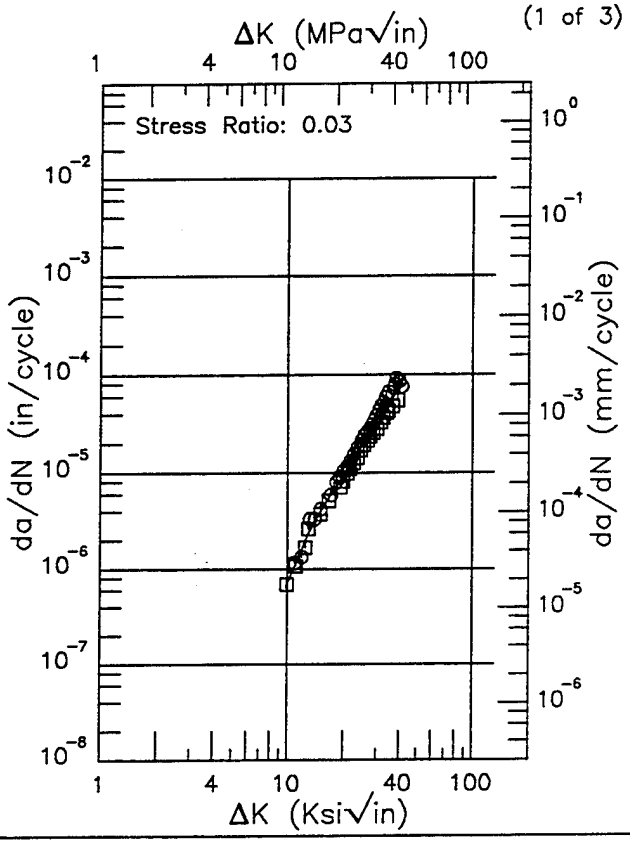
Figure 6.16.3.1.9 (Concluded)

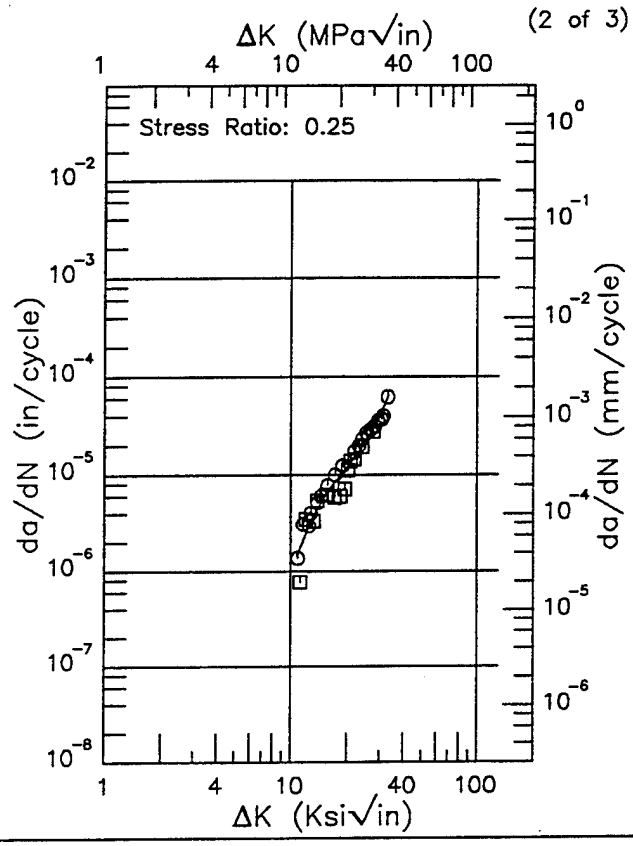
R

Ti–6Al–4V

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;300°F

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.252 in.
Specimen Width: 0.991 – 0.999 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.83 (min)	0.644
10.	0.709
13.	2.40
16.	4.92
20.	9.75
25.	19.7
30.	34.6
35.	53.3
40.	76.6
41.12 (max)	82.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.90 (min)	1.46
13.	3.46
16.	6.88
20.	11.9
25.	20.9
30.	39.8
32.83 (max)	60.4

RMS % Error	Life Prediction Ratio Summary
14.98	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
22.63	0. .5 .8 1.25 2.

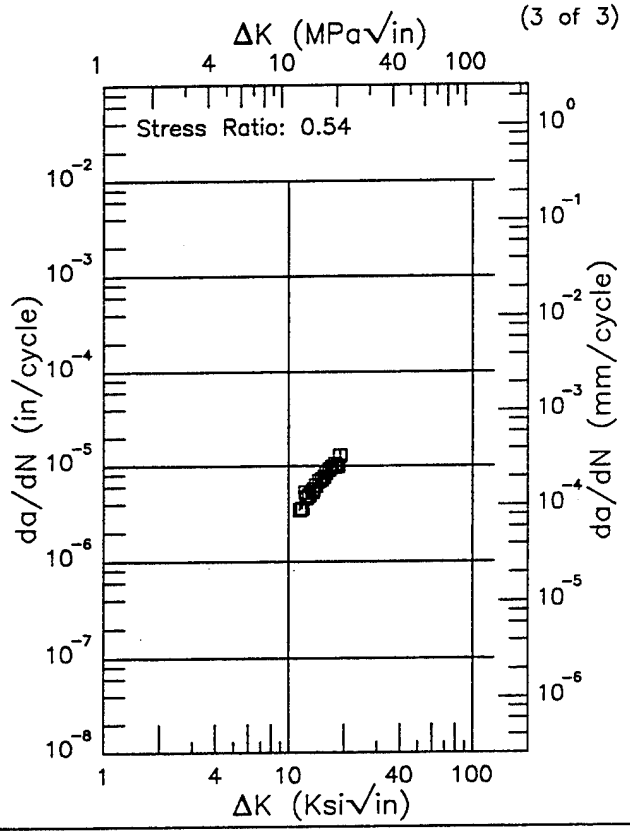
Figure 6.16.3.1.10

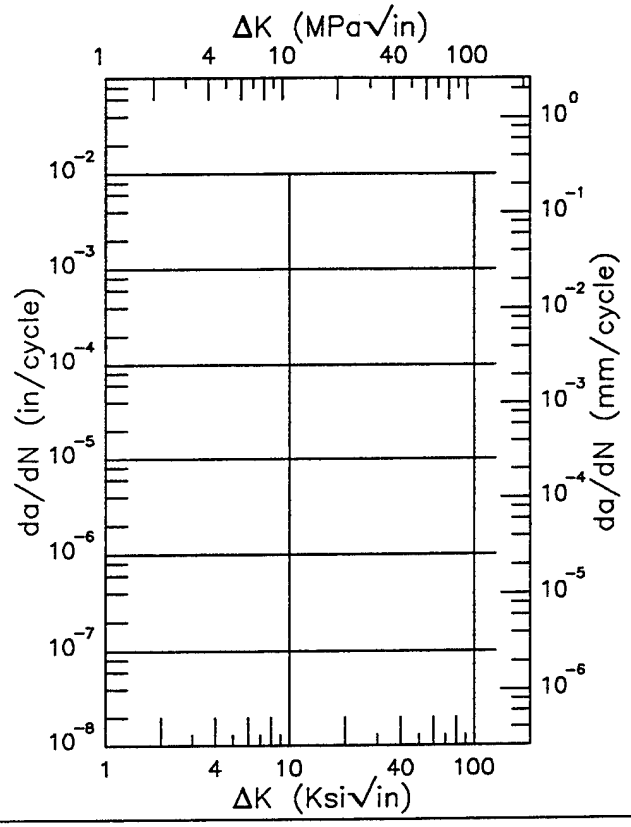
Ti–6Al–4V R

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR;300°F

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.252 in.
Specimen Width: 0.991 – 0.999 in.
Ref: GE007

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.42 (min)	3.45
13.	5.10
16.	8.22
18.98 (max)	11.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
6.81	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

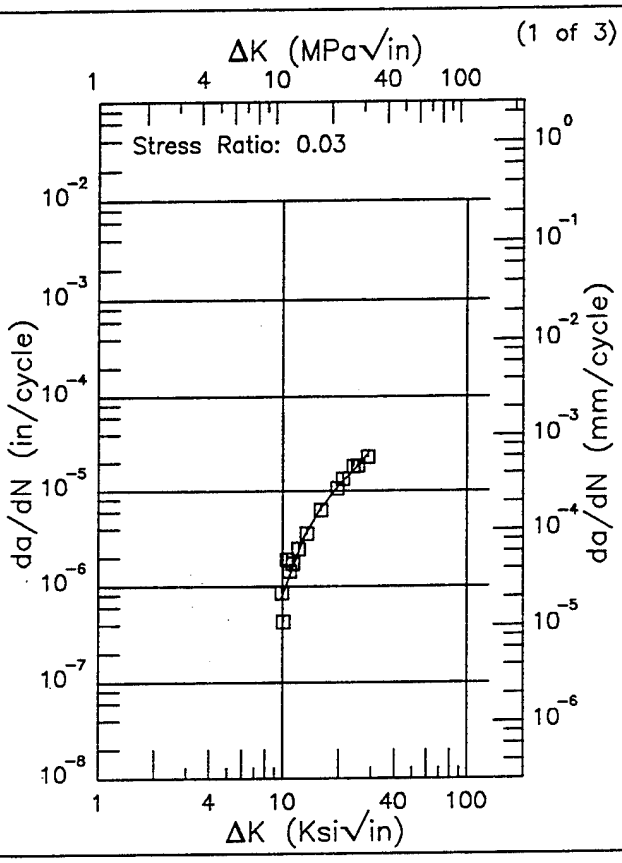
Figure 6.16.3.1.10 (Concluded)

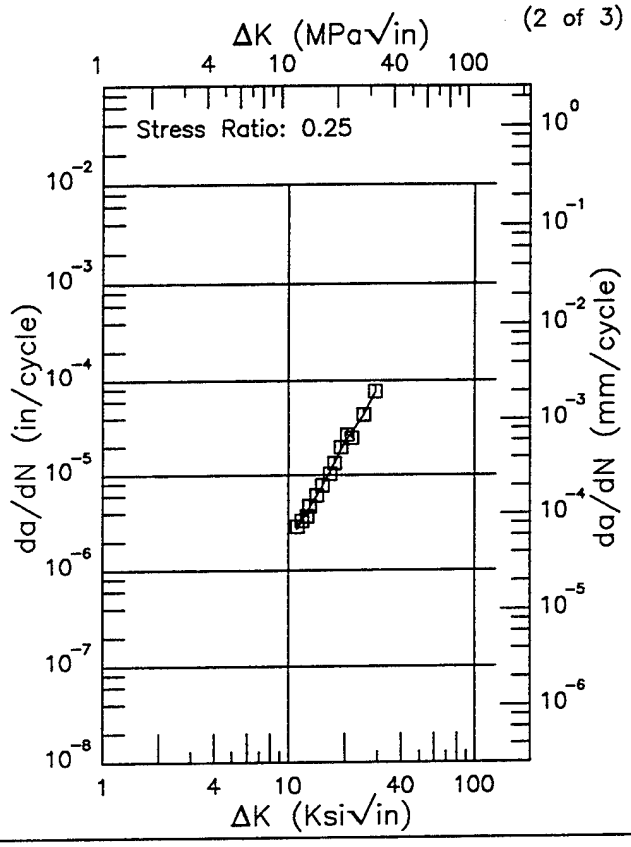
R

Ti–6Al–4V

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR; RT

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.252 in.
Specimen Width: 0.996 – 1 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.85 (min)	0.744
10.	0.822
13.	3.27
16.	6.67
20.	11.5
25.	18.0
28.66 (max)	24.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.13 (min)	2.70
13.	4.59
16.	9.26
20.	22.1
25.	41.5
29.06 (max)	76.2

RMS % Error	Life Prediction Ratio Summary
27.22	0. .5 .8 1.25 2.

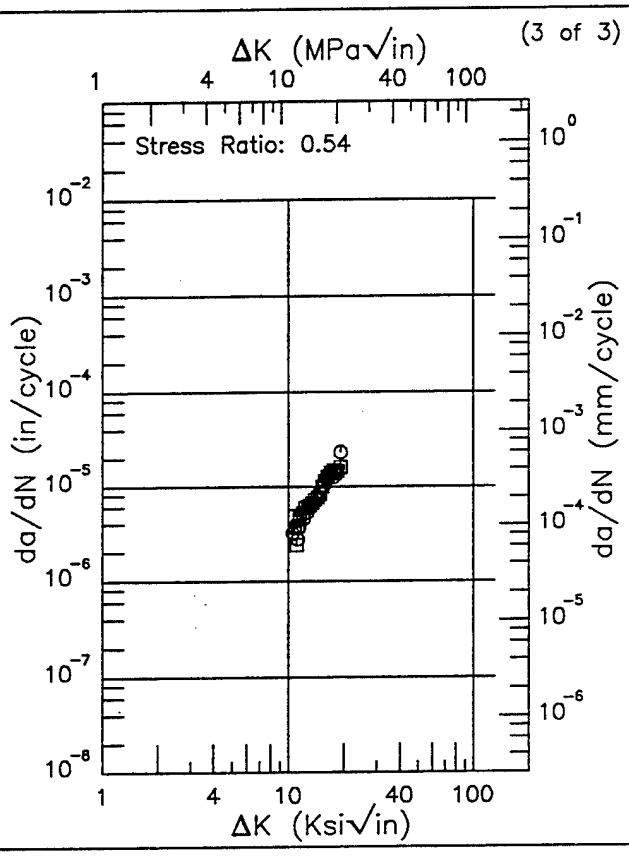
RMS % Error	Life Prediction Ratio Summary
5.32	0. .5 .8 1.25 2.

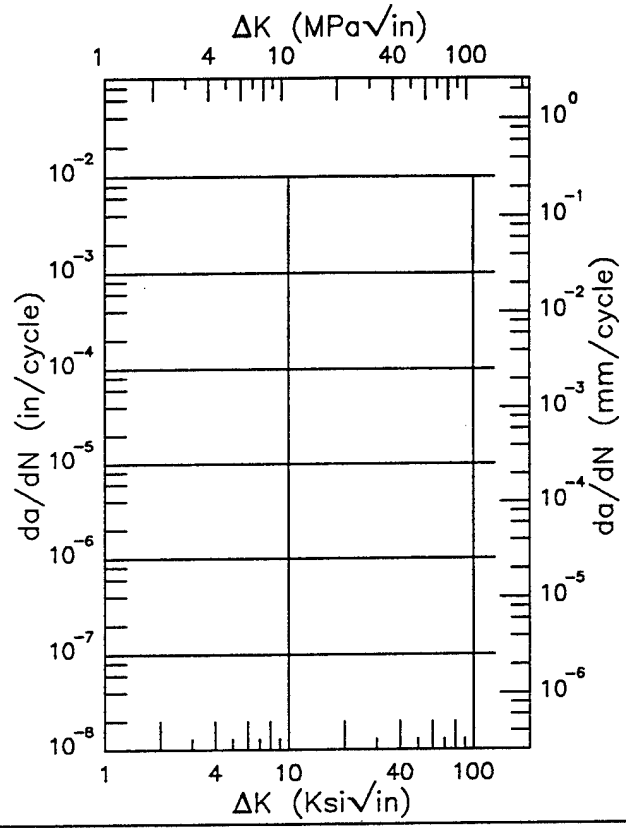
Figure 6.16.3.1.11

Ti–6Al–4V R

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.3 Hz
Environment: LAB AIR; RT

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.252 in.
Specimen Width: 0.996 – 1 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.48 (min)	3.27
13.	6.41
16.	12.1
19.06 (max)	16.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
13.84	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

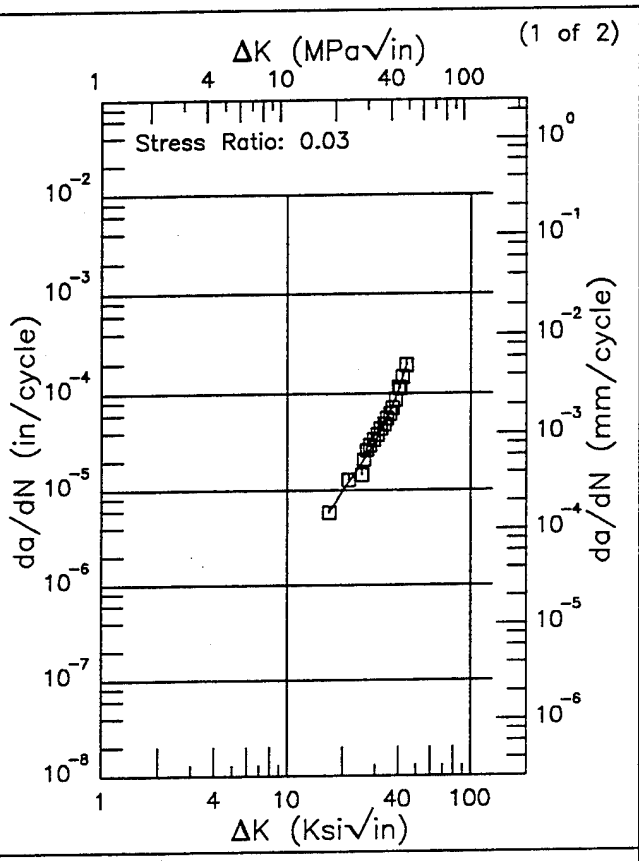
Figure 6.16.3.1.11 (Concluded)

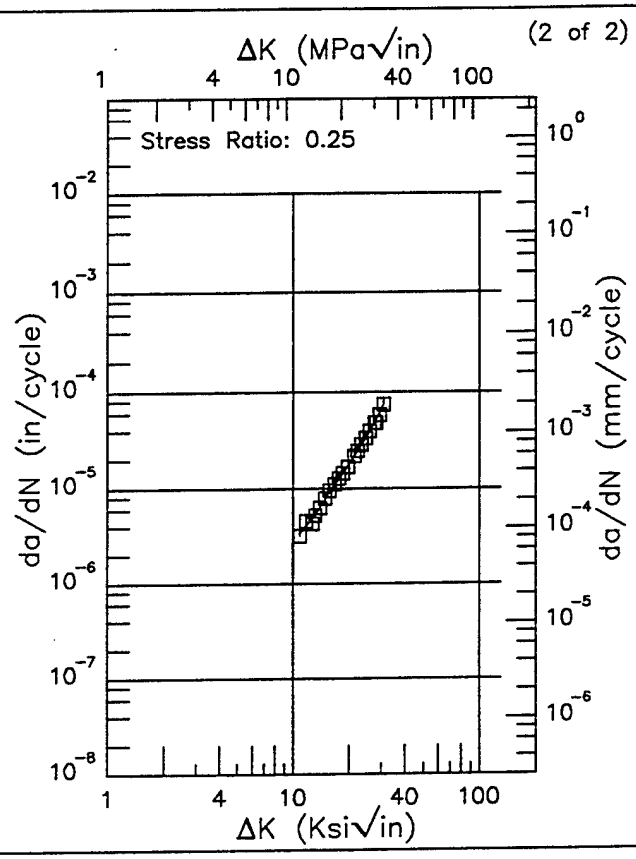
Ti–6Al–4V

R

Condition/Ht: 1775F 1HR WQ 1675F 1HR WQ 1000F–1200F 2–8HR AC
Form: 0.94 in. Disk
Specimen Type: KB Bar
Orientation: C–R
Frequency: 0.5 Hz
Environment: LAB AIR; RT

Yield Strength: 150 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.252 in.
Specimen Width: 0.989 – 0.997 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.74 (min)	5.90
20.	9.93
25.	18.3
30.	32.2
35.	57.6
40.	107.
44.18 (max)	186.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.87 (min)	3.43
13.	5.09
16.	9.55
20.	17.7
25.	35.2
30.	65.8
30.68 (max)	73.7

RMS % Error	Life Prediction Ratio Summary
8.13	0. .5 .8 1.25 2.

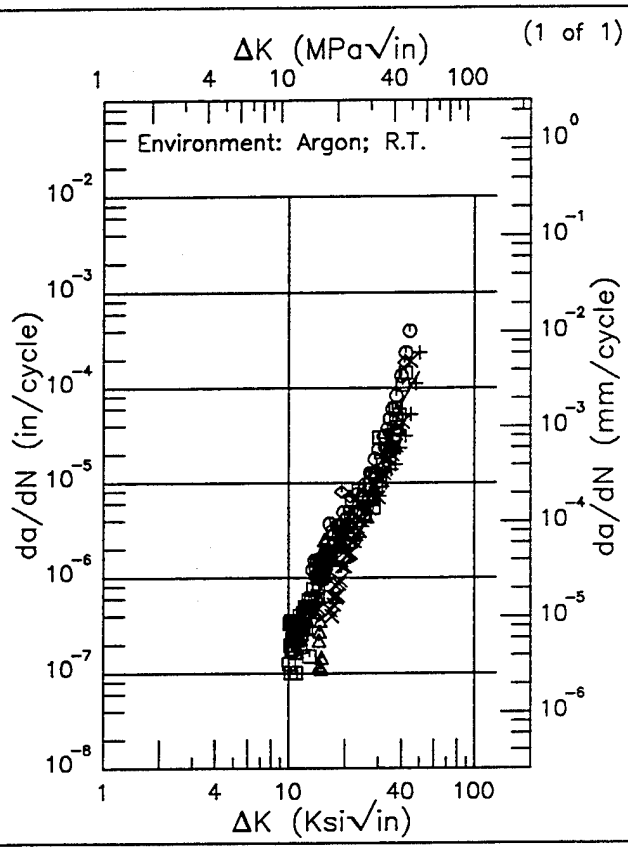
RMS % Error	Life Prediction Ratio Summary
4.71	0. .5 .8 1.25 2.

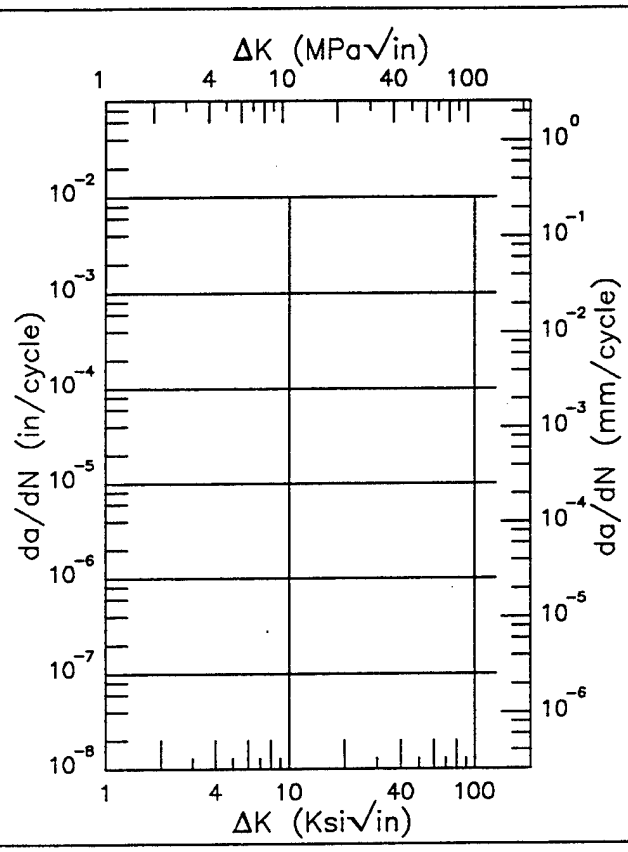
Figure 6.16.3.1.12

Ti–6Al–4V E

Condition/Ht: 1950F 4HRS WQ 1000F 4HRS ARGON COOLED
Form: Forging
Specimen Type: WOL
Orientation: R–C
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 136.4 ksi
Ult. Strength: 147.8 ksi
Specimen Thk: 0.8 in.
Specimen Width: 2.55 in.
Ref: UM001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.04 (min)	0.187
13.	0.492
16.	1.12
20.	2.52
25.	5.06
30.	10.7
35.	26.8
40.	68.3
50.	148.
50.06 (max)	147.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
61.91	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.13

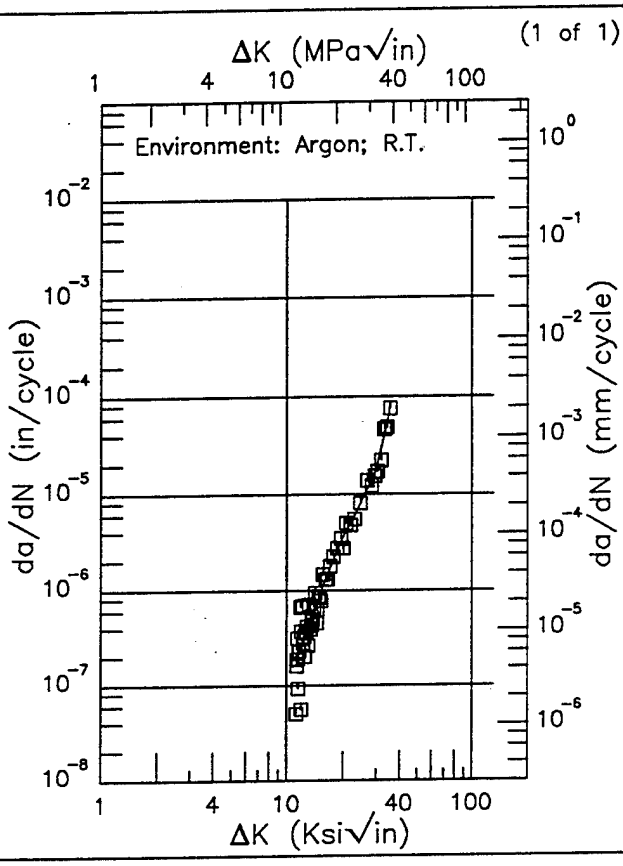
Ti–6Al–4V

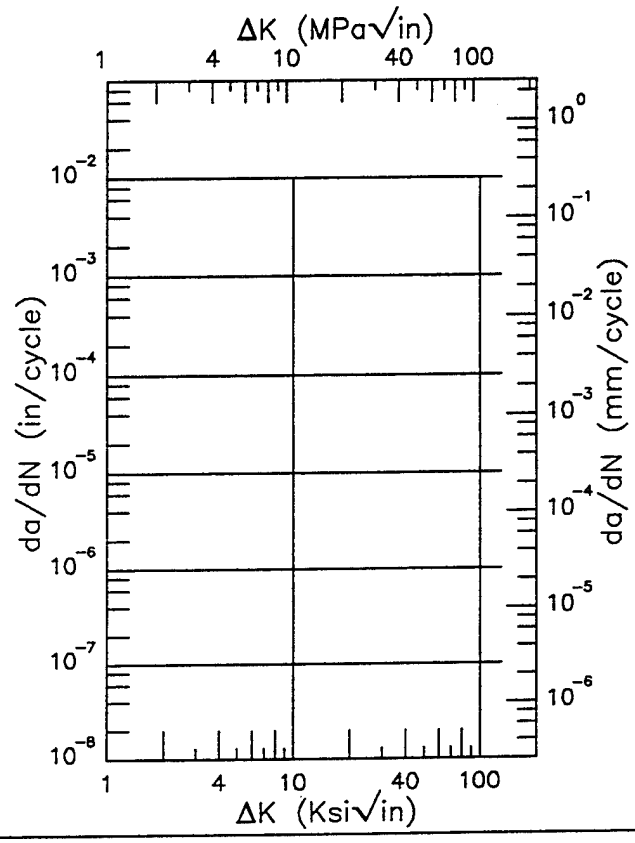
E

Condition/Ht: 1950F 4HRS WQ 1000F 4HRS ARGON COOLED
Form: Forging
Specimen Type: WOL
Orientation: C–R
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 136.4 ksi
Ult. Strength: 147.8 ksi
Specimen Thk: 0.8 in.
Specimen Width: 2.55 in.
Ref: UM001

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.18 (min)	0.196
13.	0.410
16.	1.28
20.	3.63
25.	8.51
30.	17.9
35.	67.7
35.49 (max)	84.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 39.35

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.16.3.1.14

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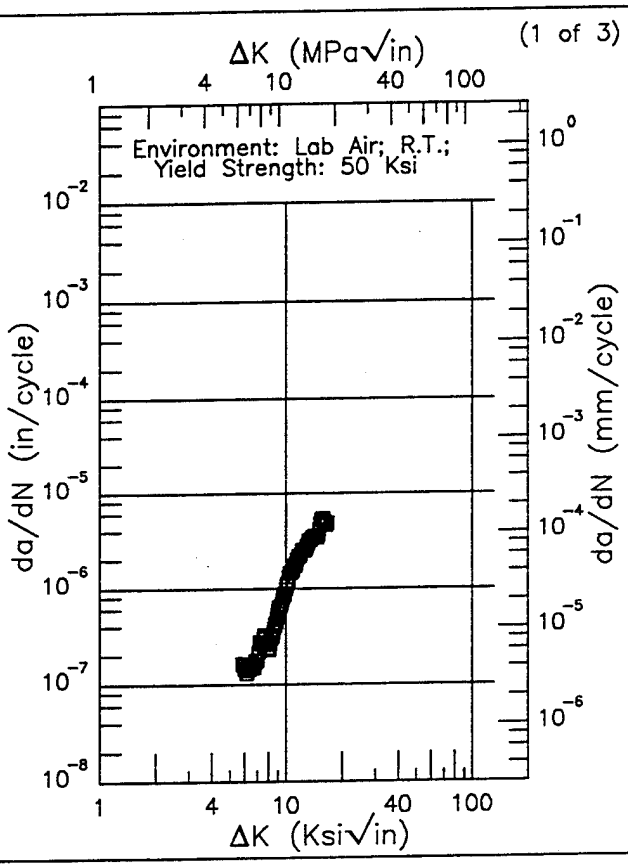
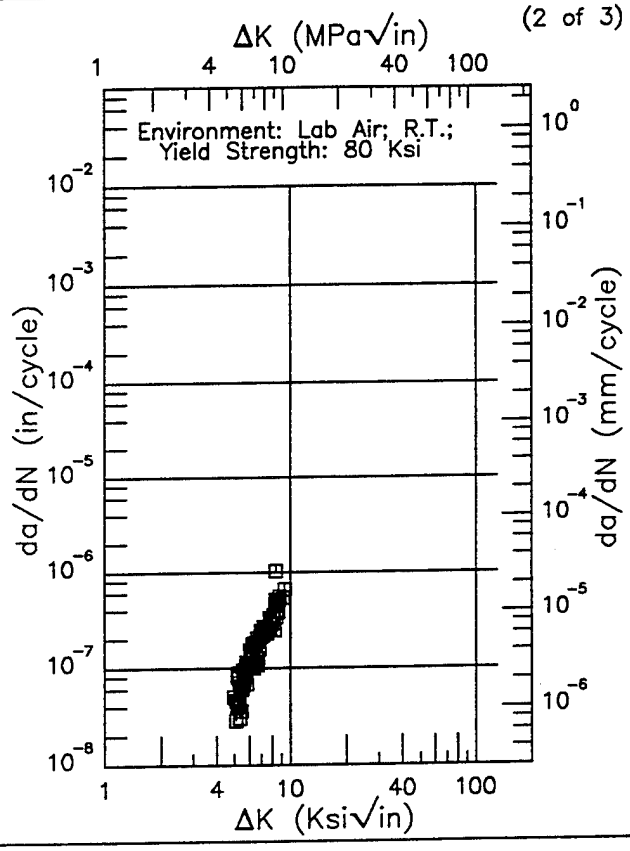
Ti–6Al–4V

E

Condition/Ht: ALPHA–BETA FORGE–ANNEALED
Form: Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength: 50 – 100 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.252 in.
Specimen Width: 1.993 – 2.01 in.
Ref: SA001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.82 (min)	0.131
6.	0.140
7.	0.193
8.	0.287
9.	0.523
10.	1.02
13.	2.81
16.	4.89
16.51 (max)	4.90

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.93 (min)	0.0436
5.	0.0451
6.	0.110
7.	0.203
8.	0.331
9.	0.560
9.27 (max)	0.562

RMS % Error	Life Prediction Ratio Summary
12.44	0. .5 .8 1.25 2.

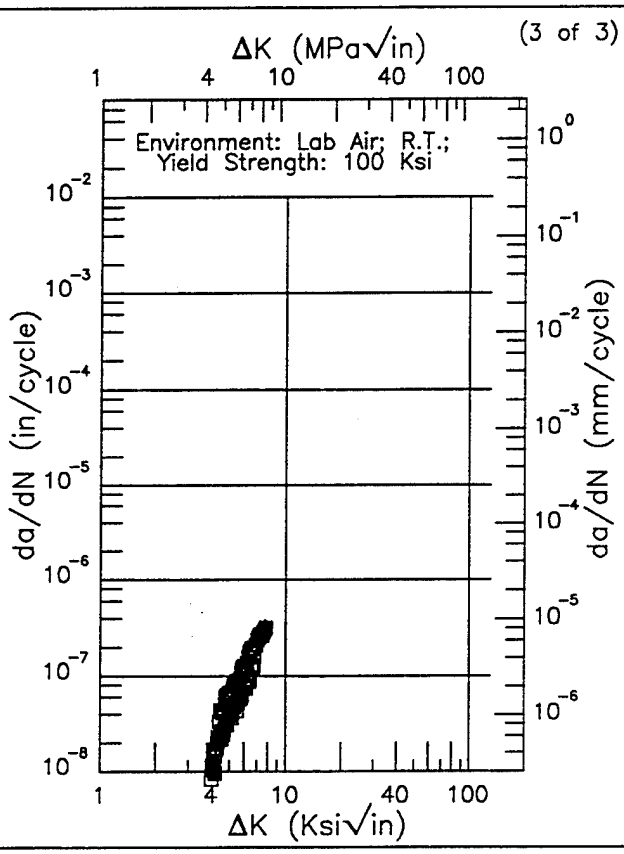
RMS % Error	Life Prediction Ratio Summary
24.71	0. .5 .8 1.25 2.

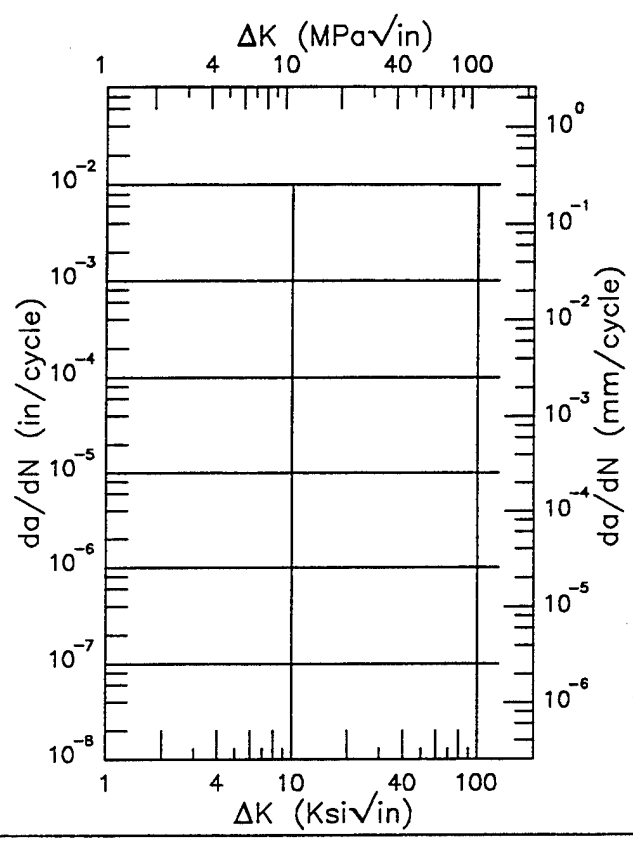
Figure 6.16.3.1.15

Ti–6Al–4V E

Condition/Ht: ALPHA–BETA FORGE–ANNEALED
Form: Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Frequency: 30 Hz

Yield Strength: 50 – 100 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.252 in.
Specimen Width: 1.993 – 2.01 in.
Ref: SA001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.98 (min)	0.00904
4.	0.00958
5.	0.0513
6.	0.101
7.	0.191
7.78 (max)	0.386

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
30.24	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.15 (Concluded)

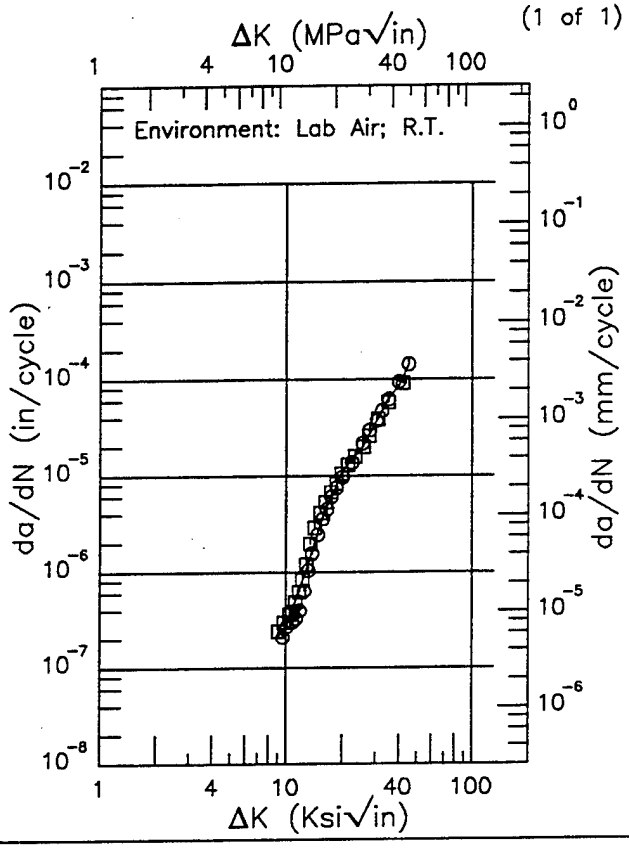
Ti–6Al–4V

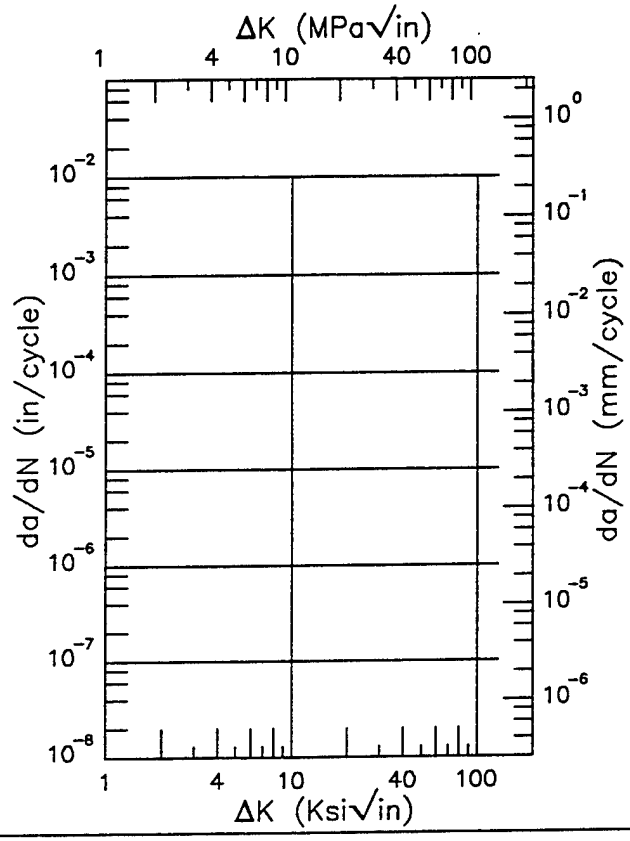
E

Condition/Ht: ANNEALED
Form: 6 in. Billet
Specimen Type: WOL
Orientation: L–T
Stress Ratio: 0.02
Frequency: 10 – 20 Hz

Yield Strength: 123 ksi
Ult. Strength: 135 ksi
Specimen Thk: 1.25 in.
Specimen Width: 5 in.
Ref: MA003

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.04 (min)	0.210
10.	0.270
13.	1.12
16.	4.22
20.	11.1
25.	18.7
30.	34.9
35.	62.7
40.	86.4
44.93 (max)	138.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 16.27

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

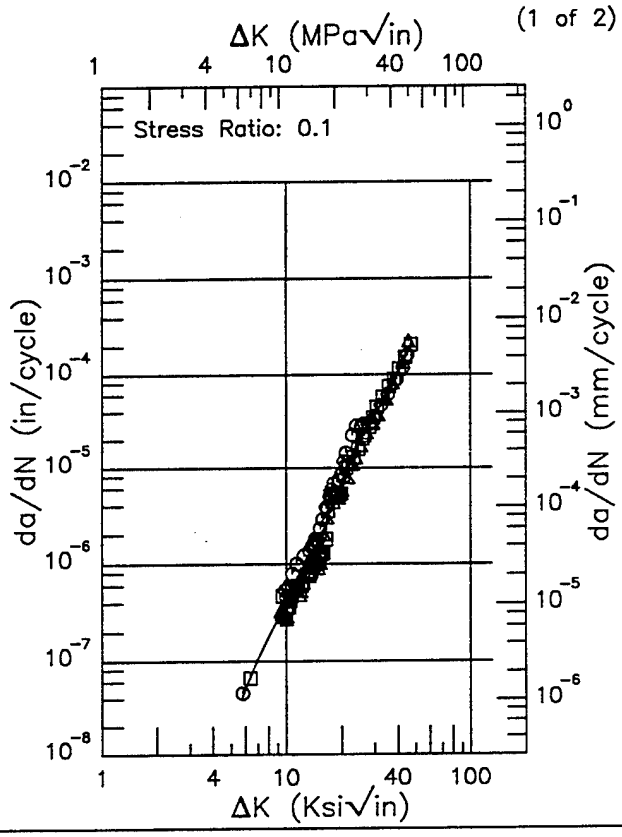
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

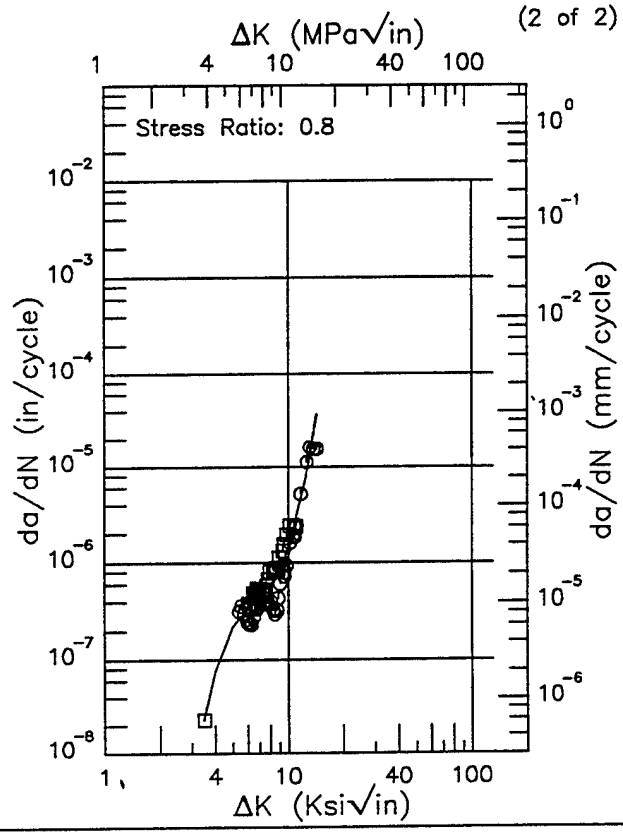
Figure 6.16.3.1.16

Ti–6Al–4V R

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: DIST WATER; RT

Yield Strength: 127.2 – 131.6 ksi
Ult. Strength:
Specimen Thk: 0.247 – 0.252 in.
Specimen Width: 2 – 2.008 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.77 (min)	0.0411
6.	0.0508
7.	0.106
8.	0.181
9.	0.275
10.	0.391
13.	0.969
16.	2.33
20.	7.49
25.	21.9
30.	37.9
35.	57.5
40.	102.
46.98 (max)	206.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.48 (min)	0.0230
3.5	0.0245
4.	0.0750
5.	0.223
6.	0.348
7.	0.453
8.	0.595
9.	0.853
10.	1.37
13.	11.6
14.23 (max)	36.8

RMS % Error 26.52

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 29.39

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

Figure 6.16.3.1.17

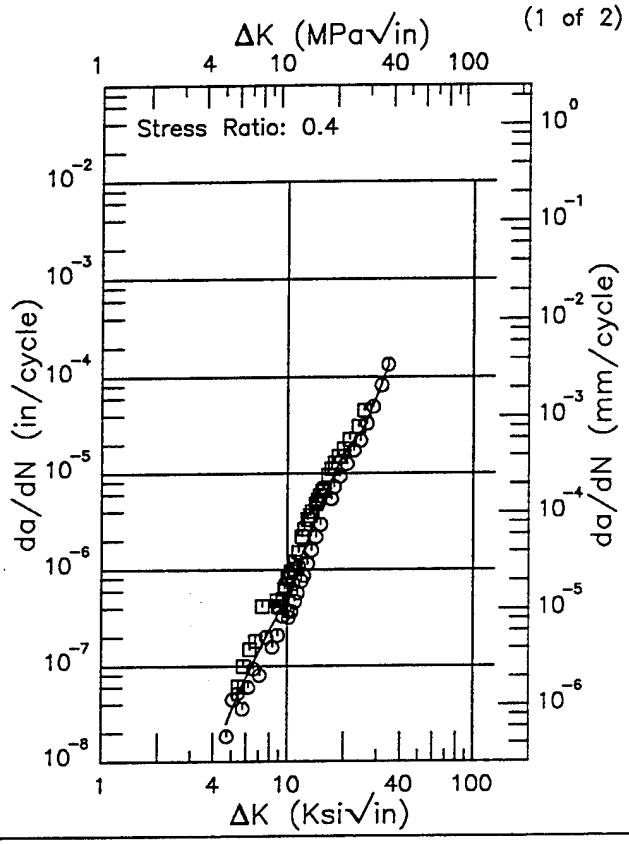
Ti–6Al–4V

R

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: L–T
Frequency: 15 Hz
Environment: LAB AIR; RT

Yield Strength: 127.2 – 131.6 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.251 in.
Specimen Width: 2.001 – 2.003 in.
Ref: DA006;DA007

(1 of 2)

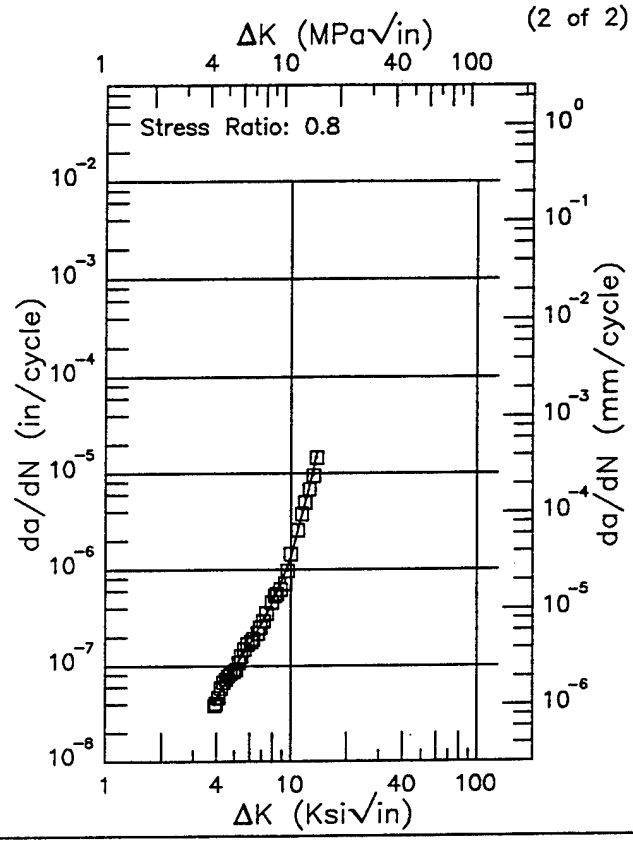


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.70 (min)	0.0249
5.	0.0340
6.	0.0770
7.	0.142
8.	0.235
9.	0.371
10.	0.572
13.	2.07
16.	6.55
20.	16.5
25.	28.2
30.	64.3
34.29 (max)	128.

RMS % Error 38.93

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.88 (min)	0.0402
4.	0.0453
5.	0.0961
6.	0.167
7.	0.276
8.	0.458
9.	0.779
10.	1.37
13.	9.09
13.76 (max)	15.3

RMS % Error 7.41

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

Figure 6.16.3.1.18

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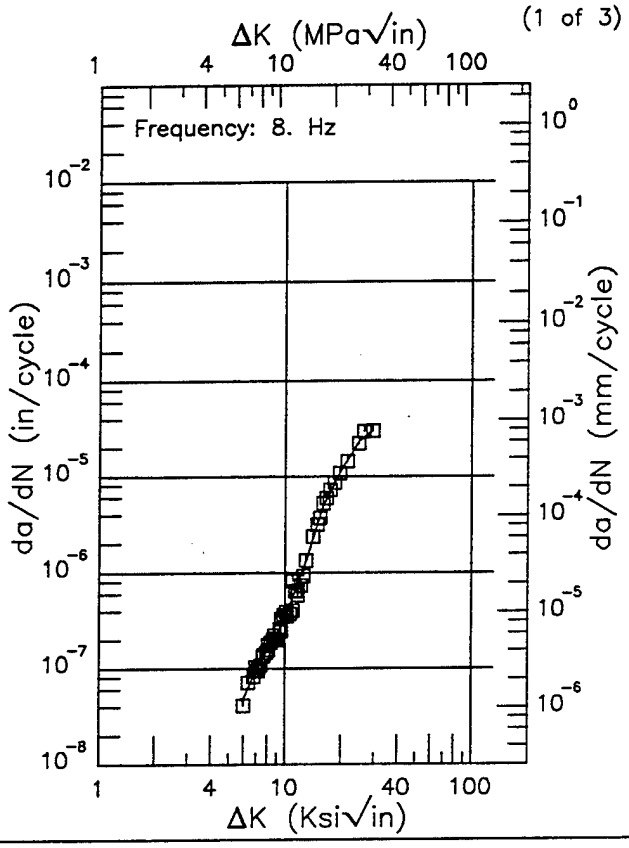
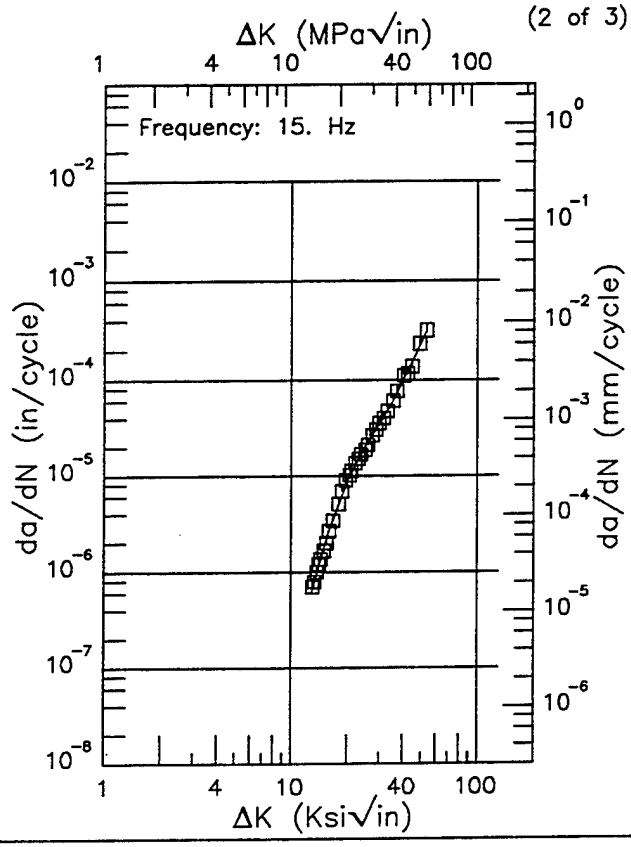
Ti–6Al–4V

F

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 127.2 – 131.6 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.252 in.
Specimen Width: 2.002 – 2.006 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.95 (min)	0.0458
6.	0.0477
7.	0.0951
8.	0.154
9.	0.229
10.	0.339
13.	1.33
16.	4.92
20.	11.6
25.	23.6
29.43 (max)	30.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.00 (min)	0.632
16.	2.63
20.	8.68
25.	20.4
30.	35.2
35.	58.7
40.	98.9
50.	243.
53.58 (max)	324.

RMS % Error	Life Prediction Ratio Summary
12.17	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
5.80	0. .5 .8 1.25 2.

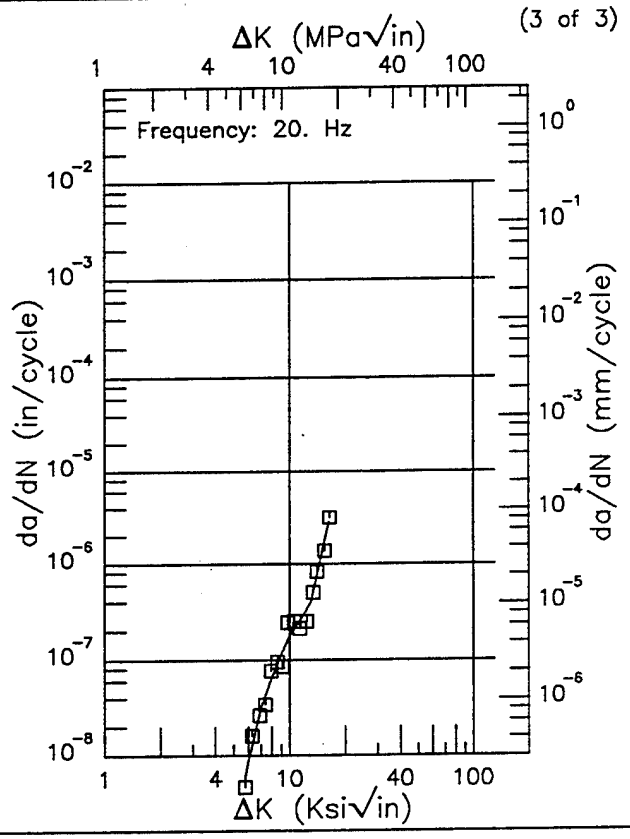
Figure 6.16.3.1.19

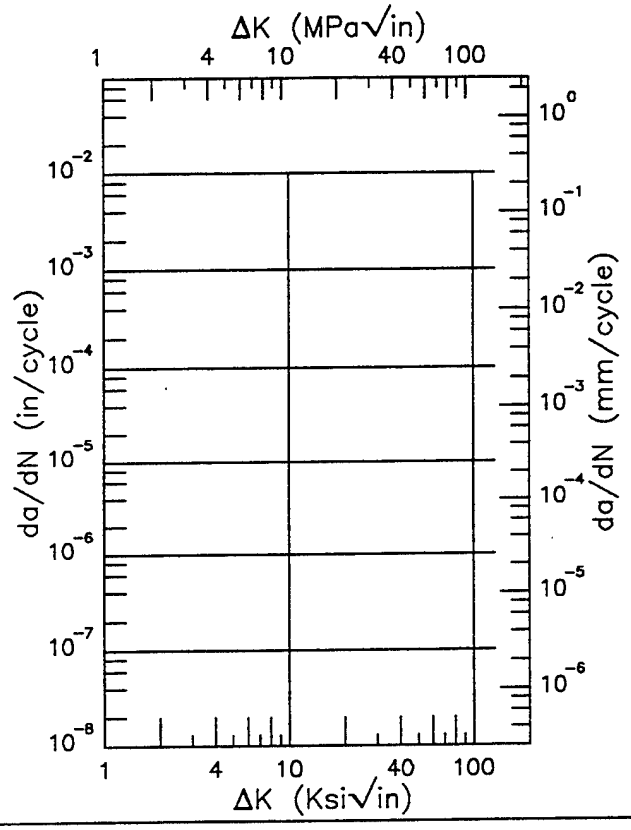
Ti–6Al–4V F

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 127.2 – 131.6 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.252 in.
Specimen Width: 2.002 – 2.006 in.
Ref: DA006;DA007

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.74 (min)	0.00539
6.	0.00891
7.	0.0317
8.	0.0561
9.	0.116
10.	0.180
13.	0.391
16.	2.52
16.26 (max)	2.83

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 21.89

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

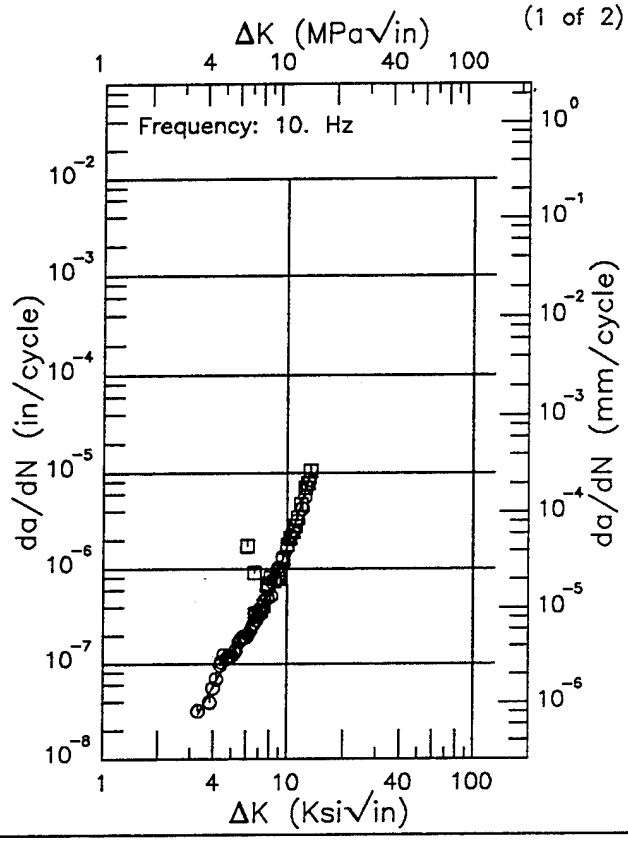
Figure 6.16.3.1.19 (Concluded)

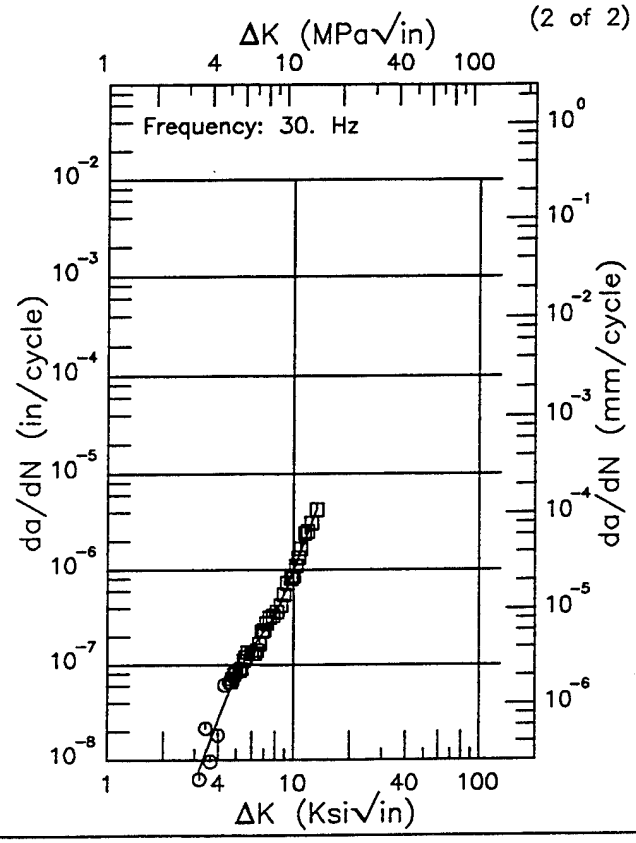
Ti–6Al–4V

F

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.8
Environment: LAB AIR; RT

Yield Strength: 127.2 – 131.6 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.253 in.
Specimen Width: 2 – 2.004 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.29 (min)	0.0294
3.5	0.0358
4.	0.0575
5.	0.133
6.	0.244
7.	0.374
8.	0.576
9.	0.965
10.	1.68
13.	8.23
13.34 (max)	10.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.16 (min)	0.00765
3.5	0.0133
4.	0.0272
5.	0.0794
6.	0.151
7.	0.227
8.	0.343
9.	0.572
10.	0.998
13.	3.82
13.25 (max)	4.07

RMS % Error	Life Prediction Ratio Summary
80.89	0. .5 .8 1.25 2.

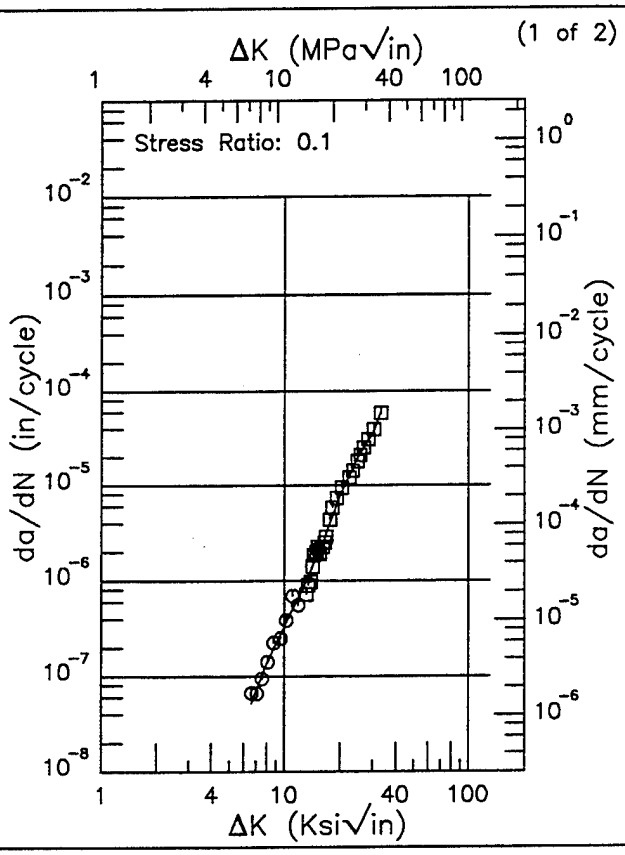
RMS % Error	Life Prediction Ratio Summary
21.98	0. .5 .8 1.25 2.

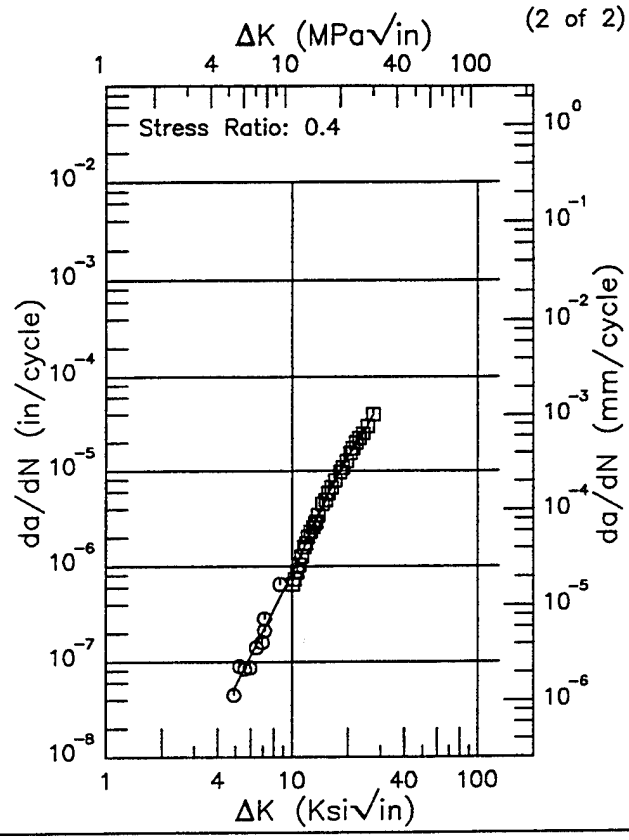
Figure 6.16.3.1.20

Ti–6Al–4V R

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: T–L
Frequency: 5 – 15 Hz
Environment: LAB AIR; RT

Yield Strength: 131.4 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.25 in.
Specimen Width: 2.002 – 2.006 in.
Ref: DA006



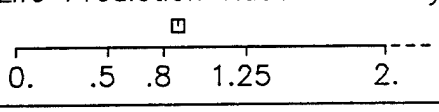


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.63 (min)	0.0527
7.	0.0706
8.	0.135
9.	0.222
10.	0.336
13.	0.938
16.	2.44
20.	7.95
25.	20.2
30.	35.4
33.16 (max)	60.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.87 (min)	0.0500
5.	0.0554
6.	0.115
7.	0.209
8.	0.350
9.	0.555
10.	0.842
13.	2.50
16.	6.09
20.	14.1
25.	28.1
27.26 (max)	38.6

RMS % Error 14.99

Life Prediction Ratio Summary



RMS % Error 13.61

Life Prediction Ratio Summary

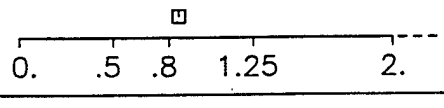


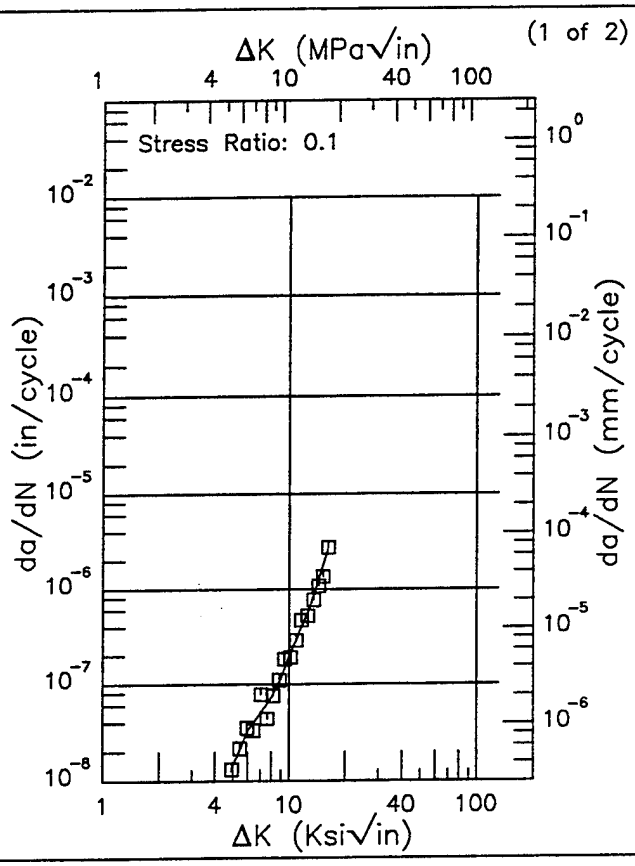
Figure 6.16.3.1.21

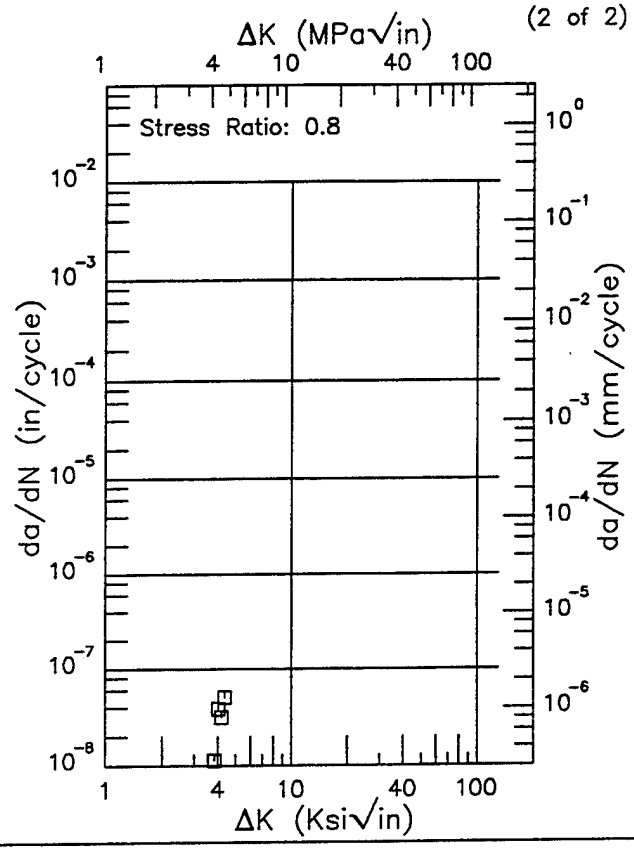
R

Ti–6Al–4V

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: T–L
Frequency: 20 Hz
Environment: LAB AIR; RT

Yield Strength: 127.9 ksi
Ult. Strength:
Specimen Thk: 0.251 in.
Specimen Width: 1.998 – 2 in.
Ref: DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.89 (min)	0.0126
5.	0.0145
6.	0.0331
7.	0.0502
8.	0.0724
9.	0.115
10.	0.197
13.	0.675
16.	2.60
16.01 (max)	2.62

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
18.88	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

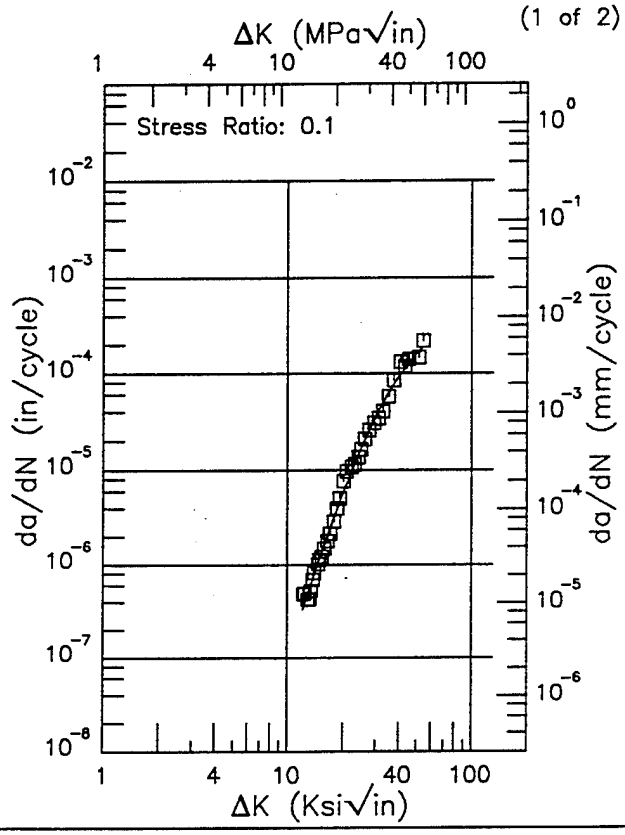
Figure 6.16.3.1.22

Ti–6Al–4V R

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: T–L
Frequency: 15 Hz
Environment: LAB AIR; RT

Yield Strength: 127.9 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.251 in.
Specimen Width: 2.002 – 2.003 in.
Ref: DA007

(1 of 2)



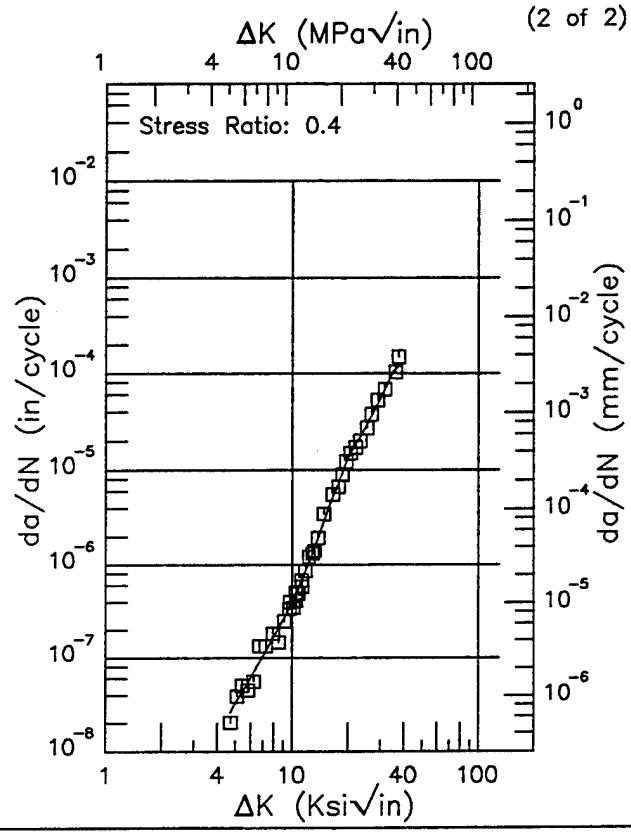
ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.19 (min)	0.330
13.	0.498
16.	1.74
20.	5.84
25.	16.9
30.	35.7
35.	61.9
40.	93.4
50.	162.
54.07 (max)	188.

RMS % Error 16.54

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.69 (min)	0.0257
5.	0.0323
6.	0.0613
7.	0.104
8.	0.167
9.	0.260
10.	0.398
13.	1.37
16.	4.34
20.	13.4
25.	28.1
30.	54.2
35.	105.
37.43 (max)	119.

RMS % Error 15.11

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

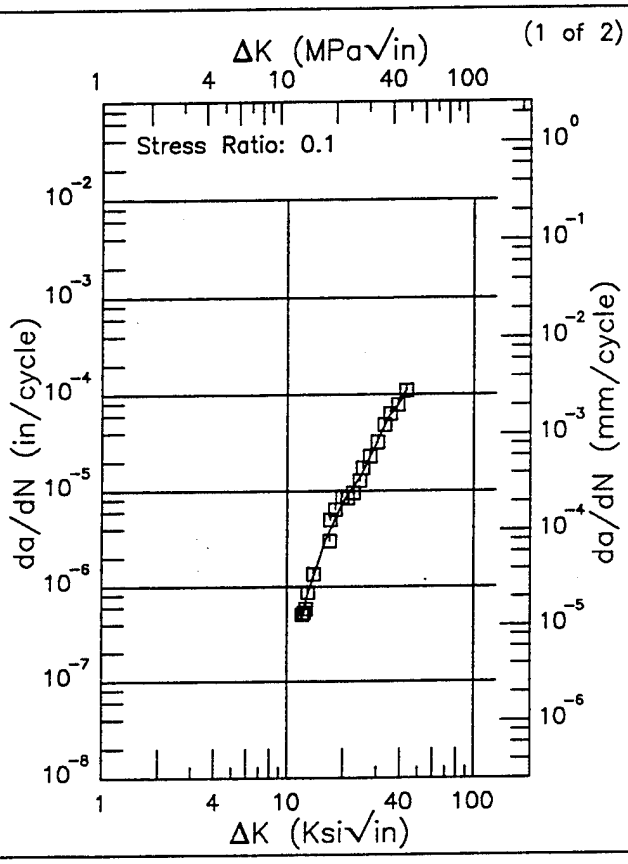
Figure 6.16.3.1.23

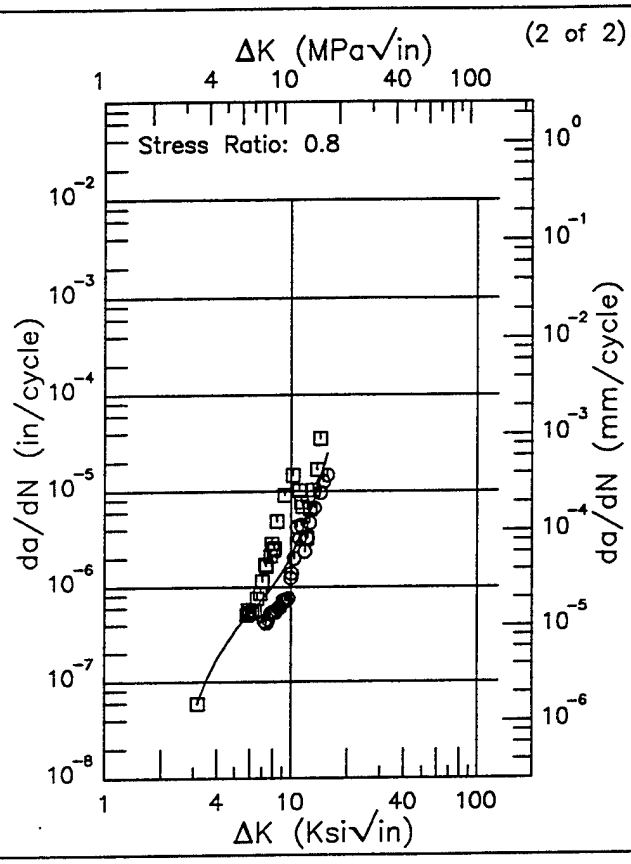
R

Ti–6Al–4V

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: DIST WATER; RT

Yield Strength: 127.9 – 131.4 ksi
Ult. Strength:
Specimen Thk: 0.25 – 0.251 in.
Specimen Width: 1.998 – 2.02 in.
Ref: DA007;DA006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.99 (min)	0.469
13.	0.863
16.	3.06
20.	7.72
25.	14.9
30.	31.2
35.	60.1
40.	83.0
43.11 (max)	109.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.13 (min)	0.0591
3.5	0.102
4.	0.175
5.	0.341
6.	0.523
7.	0.737
8.	1.02
9.	1.43
10.	2.04
13.	7.00
15.64 (max)	24.8

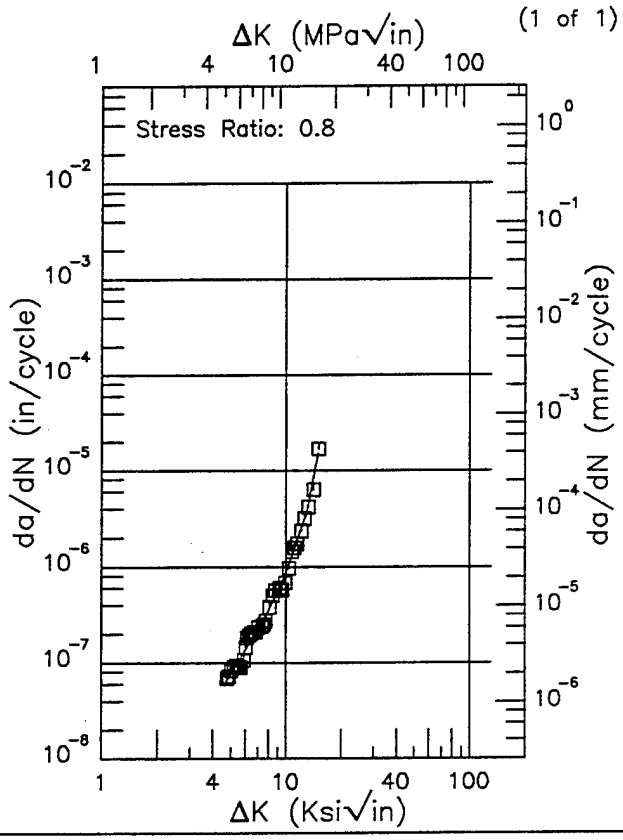
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
12.44	0. .5 .8 1.25 2.	>100.0	0. .5 .8 1.25 2.

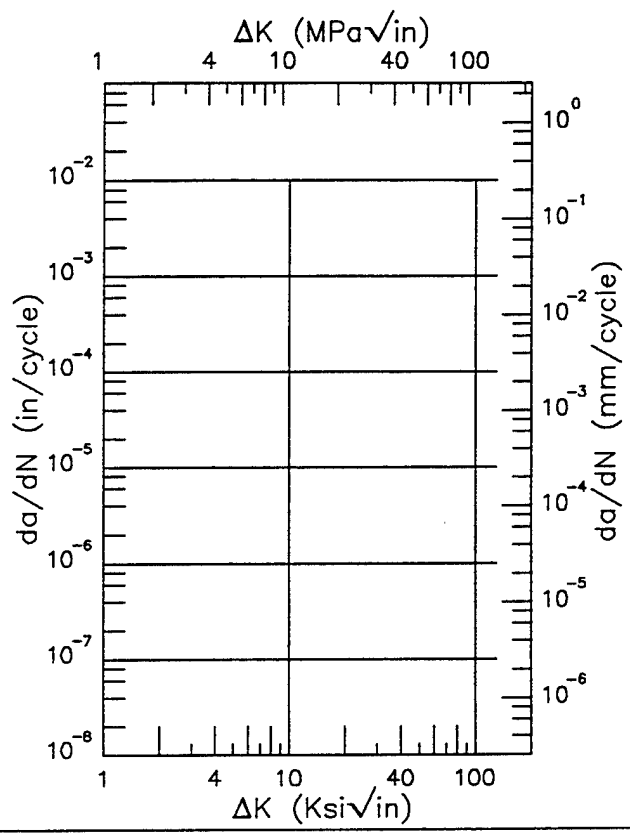
Figure 6.16.3.1.24

Ti–6Al–4V R

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CT
Orientation: T–L
Frequency: 30 Hz
Environment: LAB AIR; RT

Yield Strength: 127.9 ksi
Ult. Strength:
Specimen Thk: 0.251 in.
Specimen Width: 2 in.
Ref: DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.75 (min)	0.0646
5.	0.0765
6.	0.135
7.	0.221
8.	0.350
9.	0.552
10.	0.872
13.	3.62
14.97 (max)	15.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 12.09

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.16.3.1.25

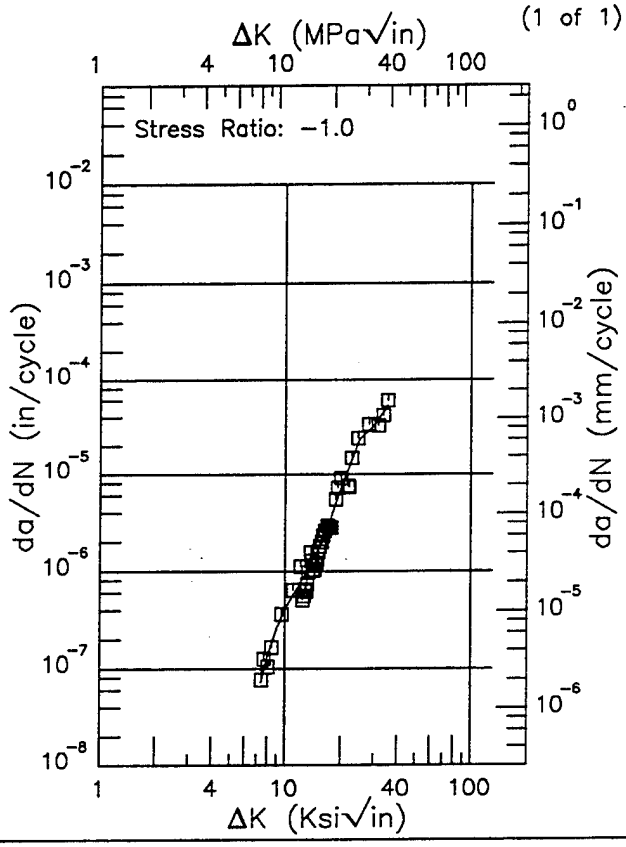
Ti–6Al–4V

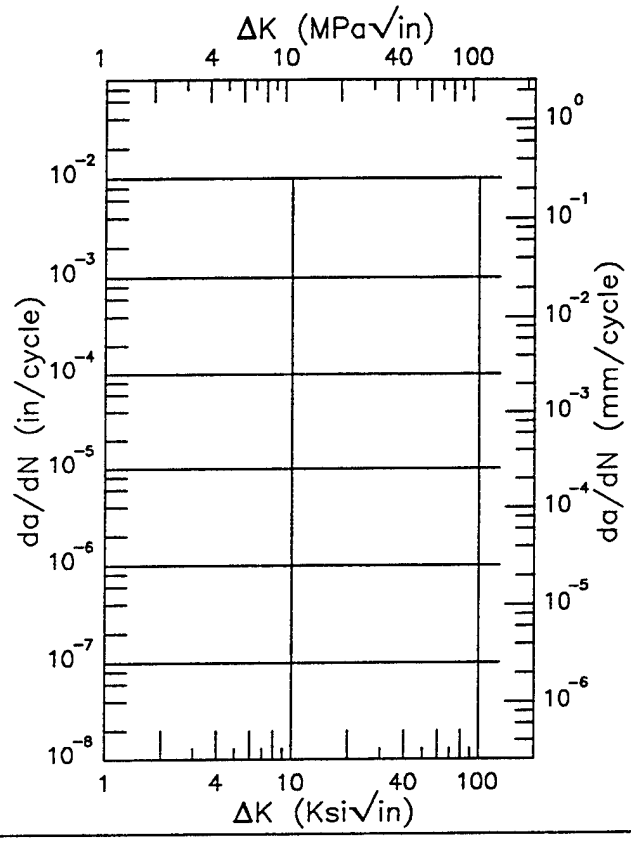
R

Condition/Ht: ANNEALED
Form: 1.75 in. Extrusion
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 5 Hz
Environment: LAB AIR; RT

Yield Strength: 131.6 ksi
Ult. Strength:
Specimen Thk: 0.198 in.
Specimen Width: 4.009 in.
Ref: DA006

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.42 (min)	0.0720
8.	0.129
9.	0.260
10.	0.414
13.	0.957
16.	2.04
20.	7.29
25.	23.4
30.	32.8
35.	51.0
35.32 (max)	53.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 21.79

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

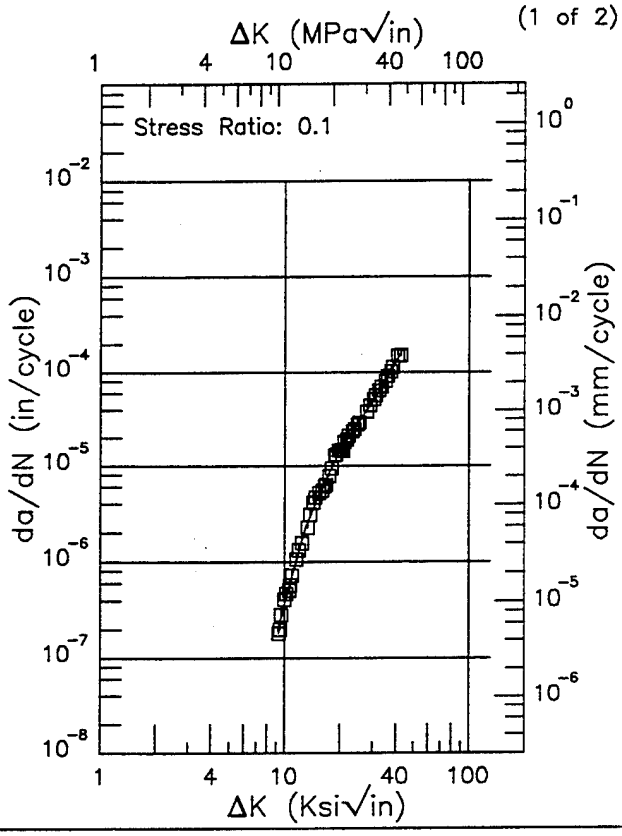
0. .5 .8 1.25 2.

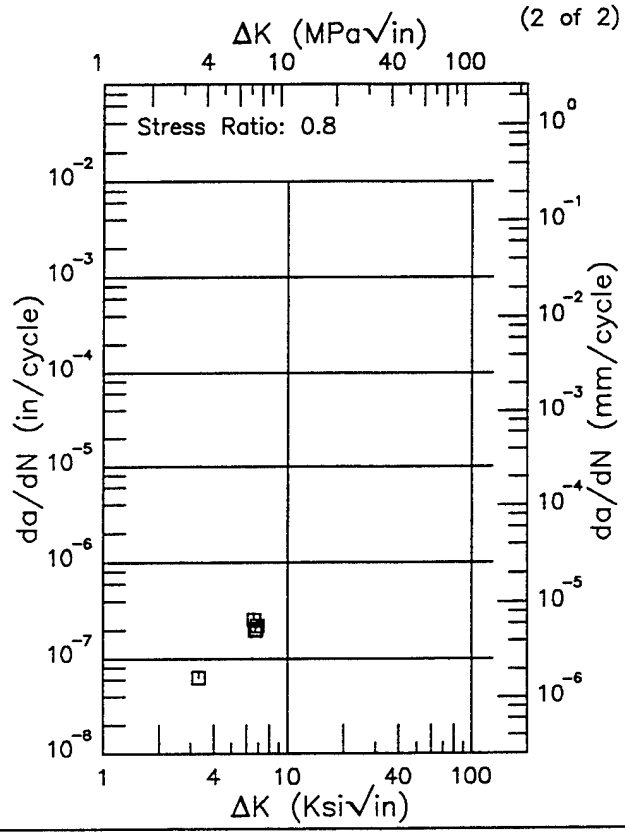
Figure 6.16.3.1.26

Ti–6Al–4V R

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: DIST WATER; RT

Yield Strength: 131.7 ksi
Ult. Strength:
Specimen Thk: 0.245 – 0.246 in.
Specimen Width: 2.007 – 2.009 in.
Ref: DA006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.25 (min)	0.196
10.	0.375
13.	2.19
16.	6.12
20.	14.3
25.	28.7
30.	49.0
35.	81.0
40.	130.
42.62 (max)	159.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.79	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

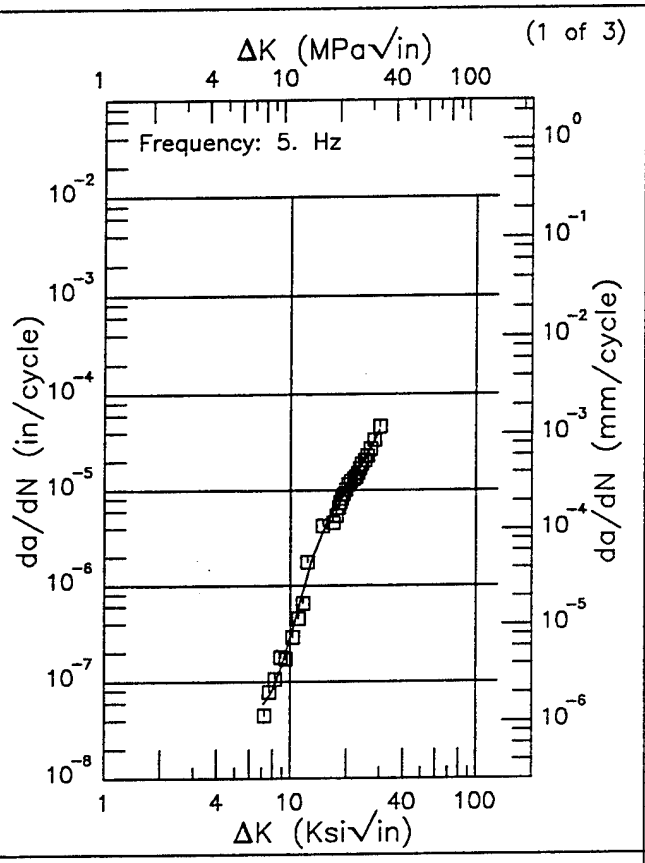
Figure 6.16.3.1.27

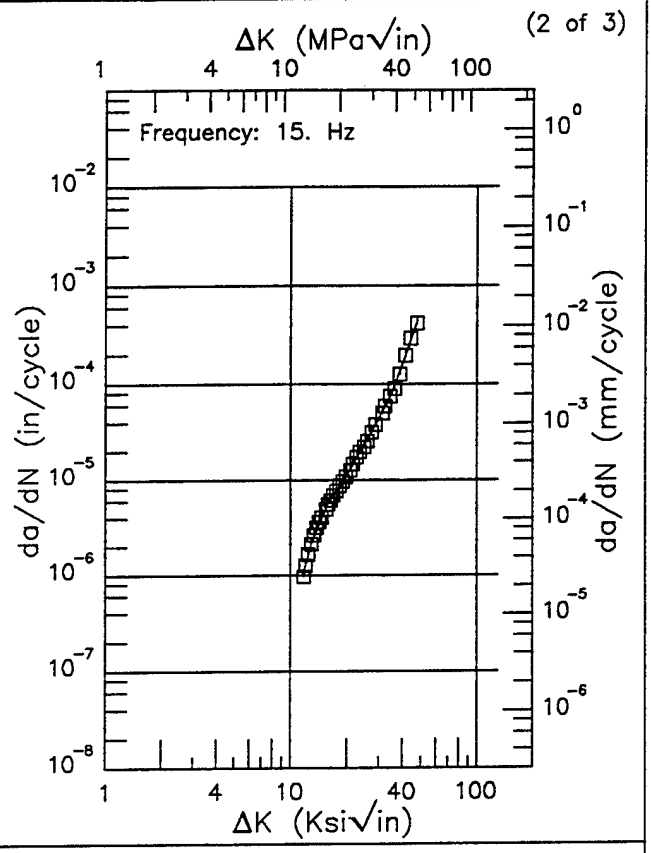
Ti–6Al–4V

F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 131.7 – 132.3 ksi
Ult. Strength:
Specimen Thk: 0.248 – 0.251 in.
Specimen Width: 2.005 – 2.007 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.19 (min)	0.0593
8.	0.0818
9.	0.149
10.	0.294
13.	1.82
16.	5.13
20.	9.53
25.	21.1
30.	43.2
30.03 (max)	43.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.75 (min)	1.04
13.	2.16
16.	5.72
20.	11.1
25.	23.2
30.	44.6
35.	79.1
40.	161.
47.45 (max)	417.

RMS % Error	Life Prediction Ratio Summary
14.91	0. .5 .8 1.25 2.

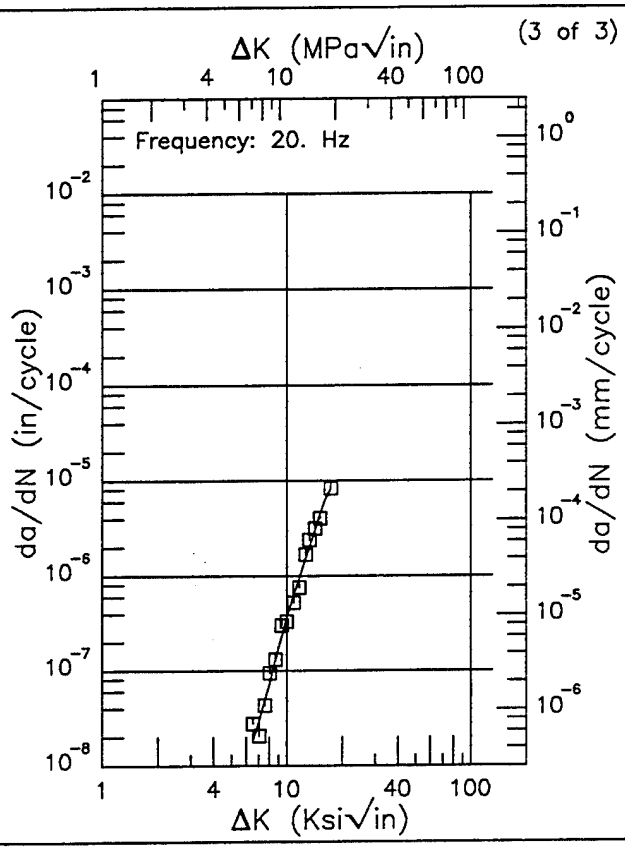
RMS % Error	Life Prediction Ratio Summary
4.13	0. .5 .8 1.25 2.

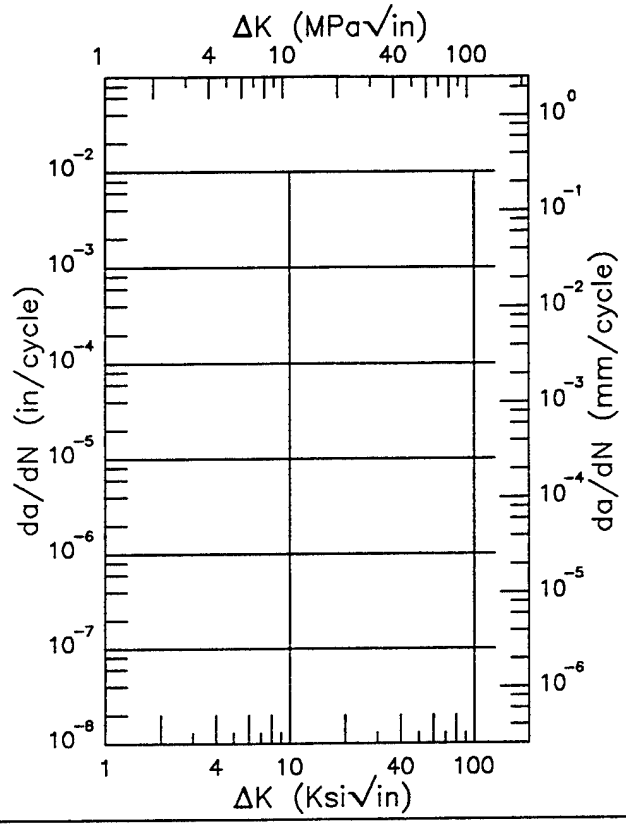
Figure 6.16.3.1.28

Ti–6Al–4V F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 131.7 – 132.3 ksi
Ult. Strength:
Specimen Thk: 0.248 – 0.251 in.
Specimen Width: 2.005 – 2.007 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.51 (min)	0.0189
7.	0.0282
8.	0.0714
9.	0.175
10.	0.376
13.	1.77
16.	6.20
17.19 (max)	8.20

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
20.95	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

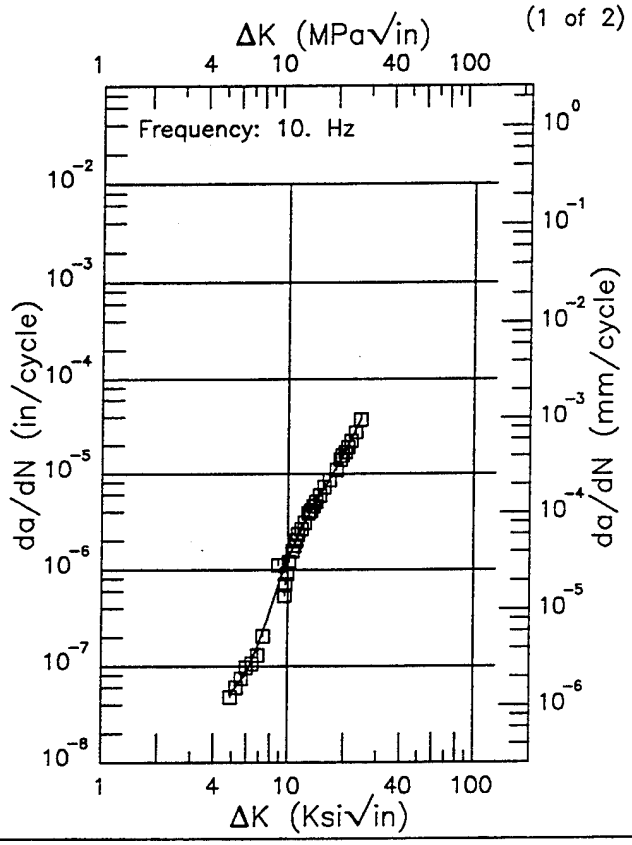
Figure 6.16.3.1.28 (Concluded)

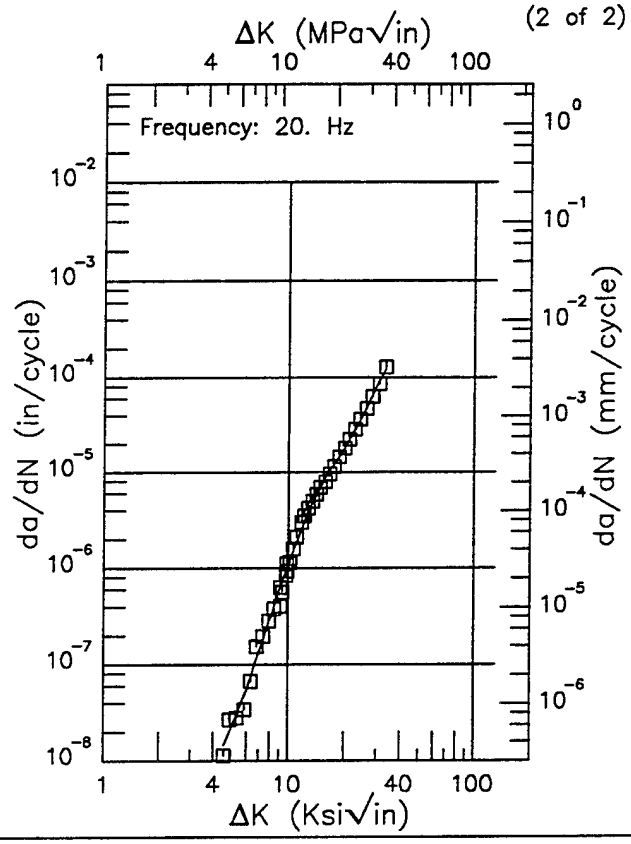
Ti–6Al–4V

F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.4
Environment: LAB AIR; RT

Yield Strength: 131.7 – 132.3 ksi
Ult. Strength:
Specimen Thk: 0.249 in.
Specimen Width: 2.005 – 2.008 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.90 (min)	0.0531
5.	0.0537
6.	0.0847
7.	0.177
8.	0.381
9.	0.755
10.	1.32
13.	3.82
16.	7.65
20.	16.3
24.31 (max)	37.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.56 (min)	0.0144
5.	0.0215
6.	0.0546
7.	0.132
8.	0.293
9.	0.591
10.	1.09
13.	4.16
16.	9.07
20.	17.6
25.	38.4
30.	83.1
33.23 (max)	121.

RMS % Error	Life Prediction Ratio Summary
17.37	0. .5 .8 1.25 2.

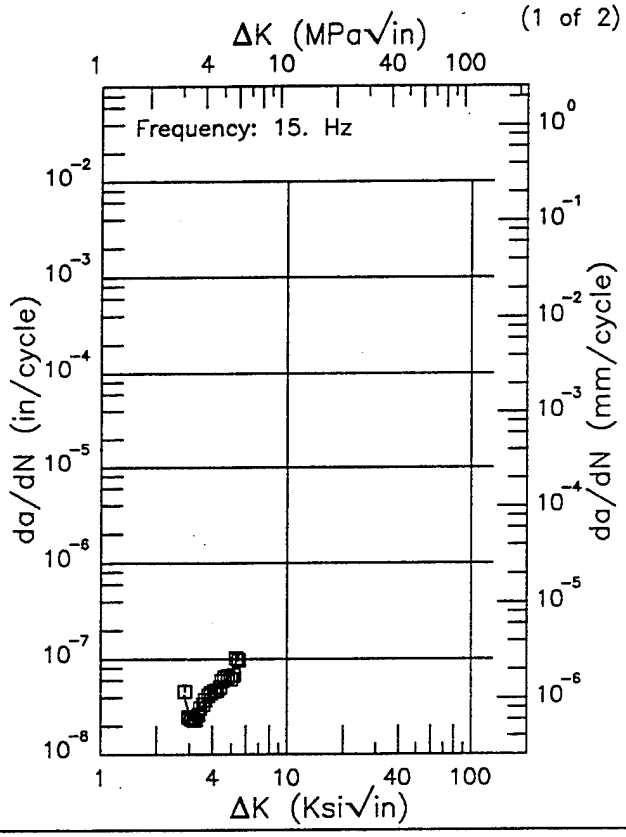
RMS % Error	Life Prediction Ratio Summary
14.81	0. .5 .8 1.25 2.

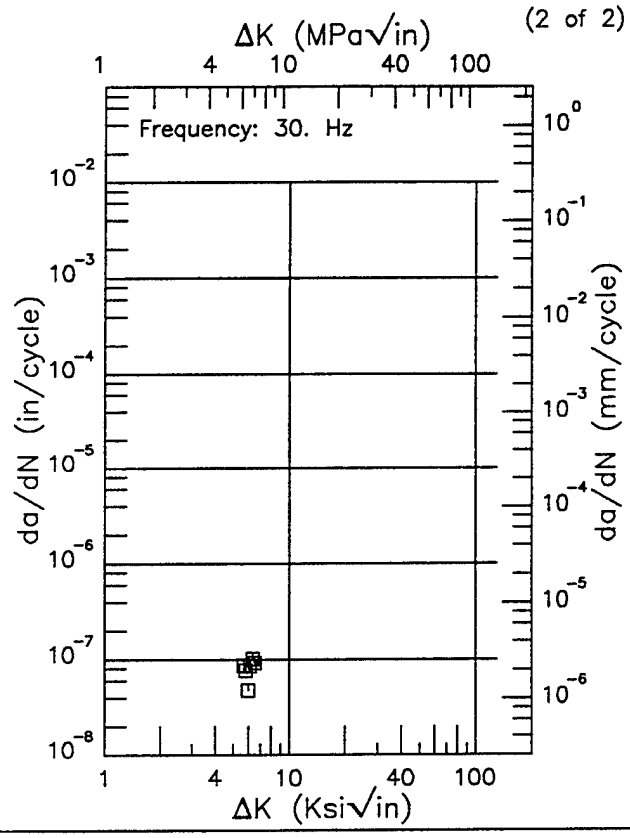
Figure 6.16.3.1.29

Ti–6Al–4V F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.8
Environment: LAB AIR; RT

Yield Strength: 131.7 – 132.3 ksi
Ult. Strength:
Specimen Thk: 0.248 – 0.249 in.
Specimen Width: 2.005 – 2.006 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
2.83 (min)	0.0422
3.	0.0253
3.5	0.0305
4.	0.0472
5.	0.0687
5.48 (max)	0.105

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
8.80	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

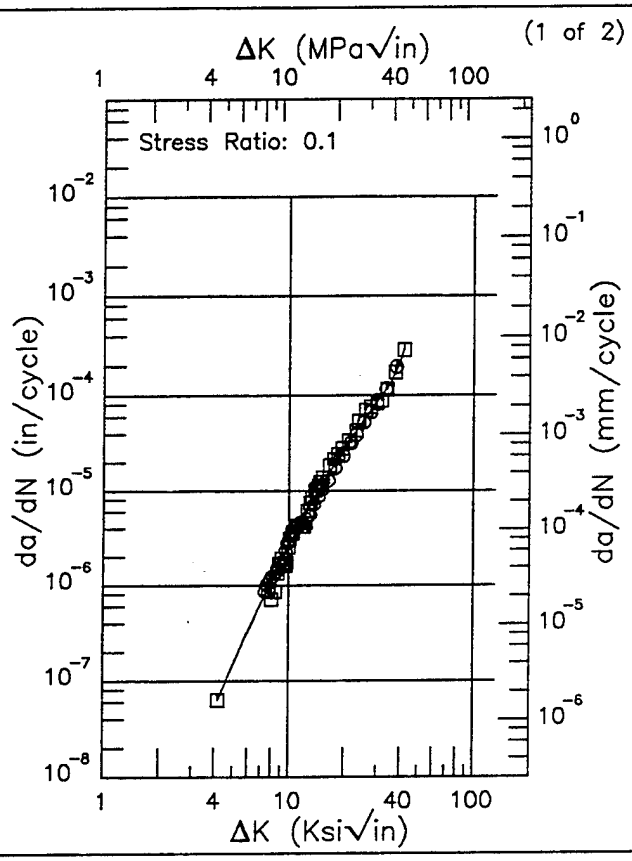
Figure 6.16.3.1.30

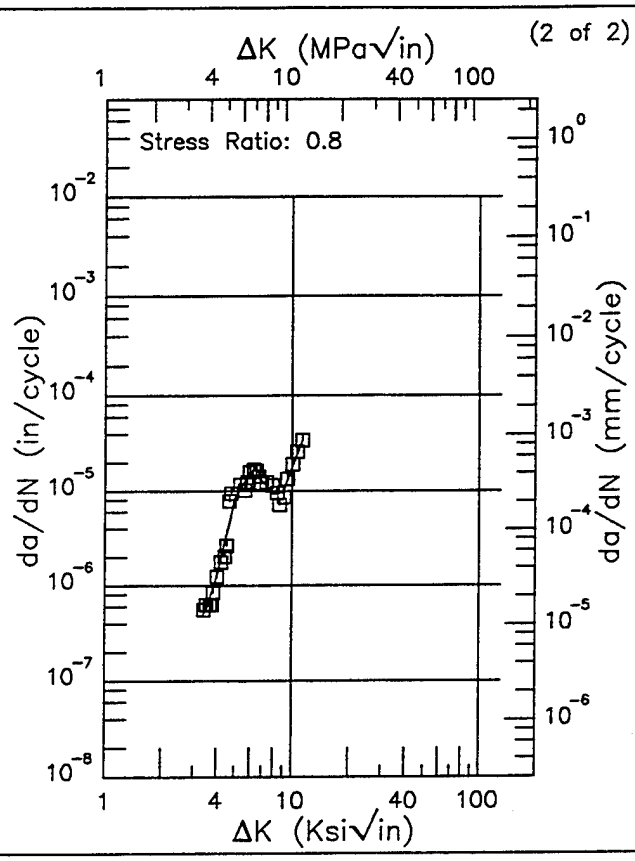
R

Ti–6Al–4V

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: DIST WATER; RT

Yield Strength: 140.1 – 144.9 ksi
Ult. Strength:
Specimen Thk: 0.248 – 0.25 in.
Specimen Width: 2 – 2.006 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.17 (min)	0.0630
5.	0.145
6.	0.326
7.	0.630
8.	1.09
9.	1.76
10.	2.64
13.	6.96
16.	14.1
20.	28.5
25.	53.8
30.	85.7
35.	130.
40.	226.
41.96 (max)	297.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.40 (min)	0.504
3.5	0.543
4.	1.22
5.	8.14
6.	15.8
7.	12.8
8.	9.26
9.	9.63
10.	17.5
11.28 (max)	33.1

RMS % Error	Life Prediction Ratio Summary
13.38	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
23.12	0. .5 .8 1.25 2.

Figure 6.16.3.1.31

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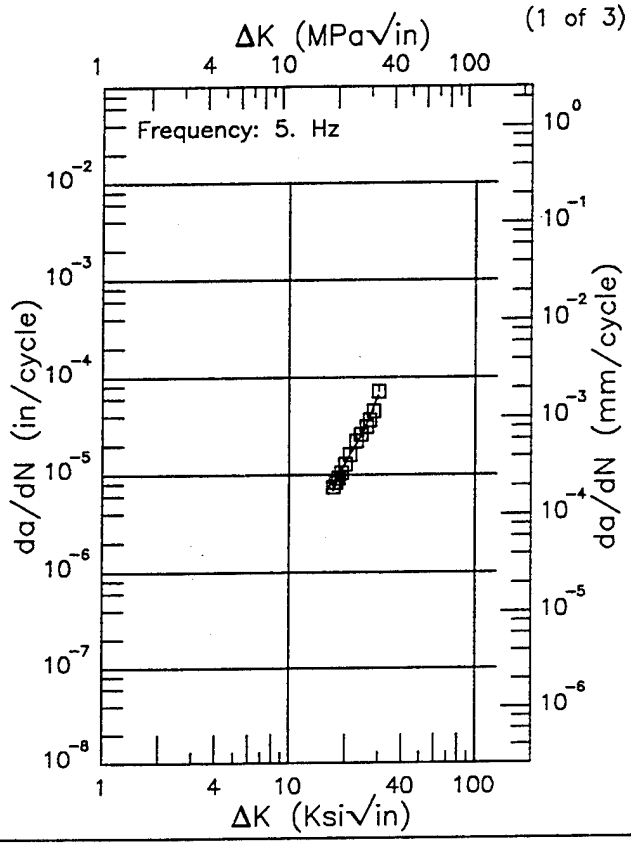
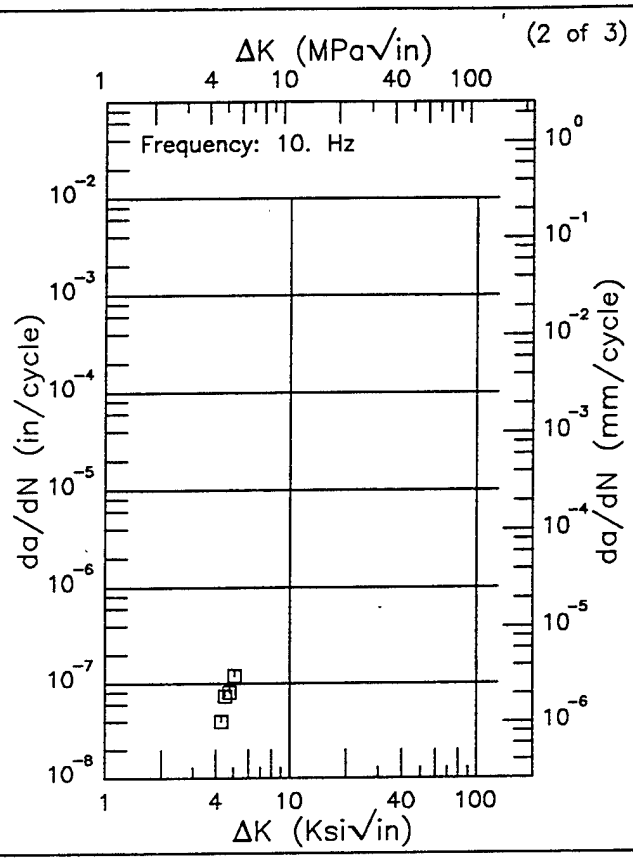
Ti–6Al–4V

F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 140.1 – 144.9 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.251 in.
Specimen Width: 2.003 – 2.008 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.23 (min)	6.86
20.	13.1
25.	27.8
29.98 (max)	65.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.66	0. .5 .8 1.25 2.

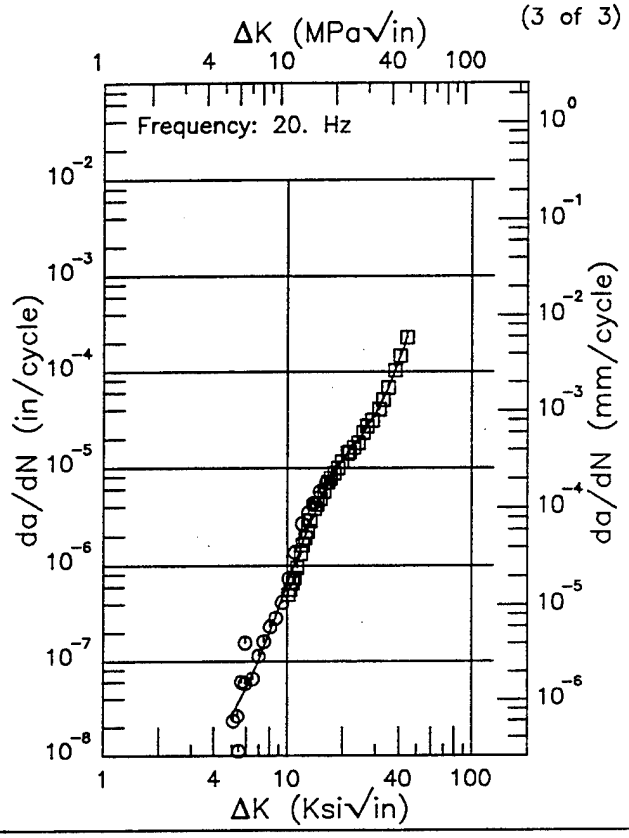
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

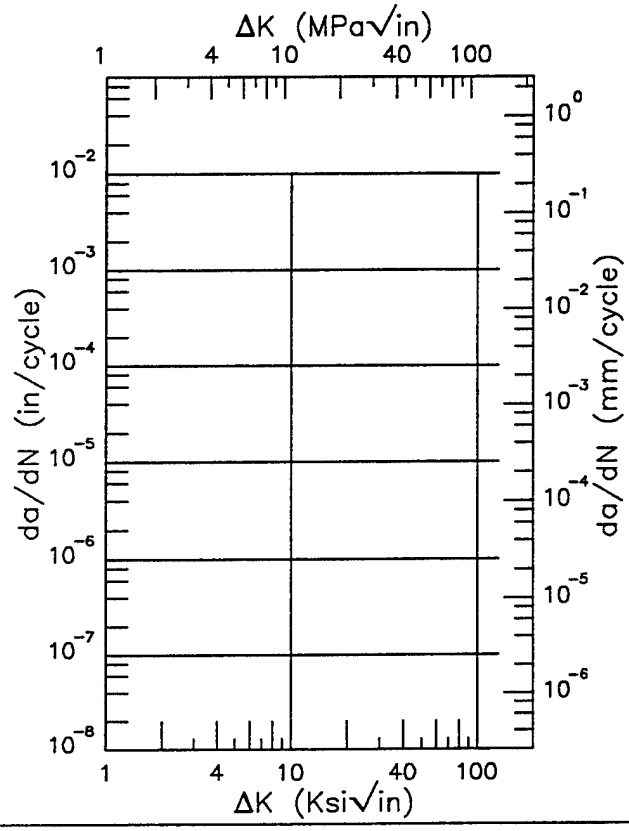
Figure 6.16.3.1.32

Ti–6Al–4V F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 140.1 – 144.9 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.251 in.
Specimen Width: 2.003 – 2.008 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.08 (min)	0.0283
6.	0.0528
7.	0.105
8.	0.204
9.	0.373
10.	0.646
13.	2.41
16.	5.91
20.	12.1
25.	21.1
30.	36.1
35.	68.0
40.	134.
44.11 (max)	231.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 37.27

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

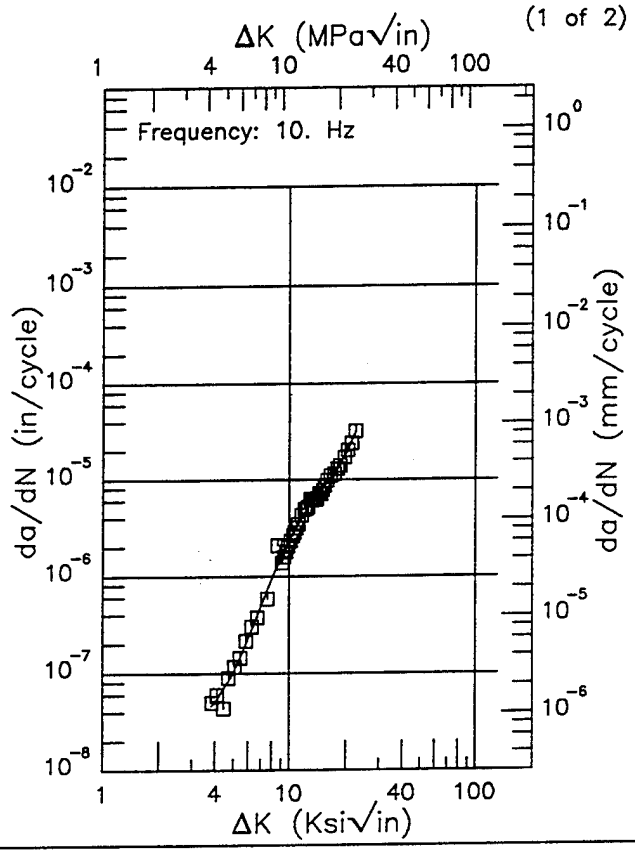
Figure 6.16.3.1.32 (Concluded)

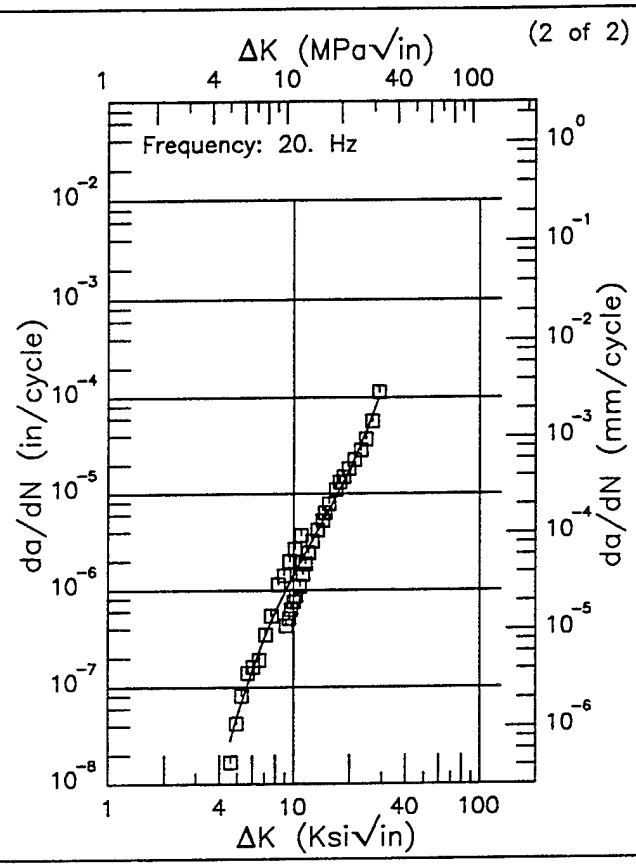
Ti–6Al–4V

F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.4
Environment: LAB AIR; RT

Yield Strength: 140.1 – 144.9 ksi
Ult. Strength:
Specimen Thk: 0.246 – 0.251 in.
Specimen Width: 2.005 – 2.006 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.83 (min)	0.0461
4.	0.0498
5.	0.0994
6.	0.224
7.	0.480
8.	0.923
9.	1.57
10.	2.41
13.	5.71
16.	9.58
20.	18.6
22.36 (max)	31.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.58 (min)	0.0279
5.	0.0508
6.	0.149
7.	0.325
8.	0.589
9.	0.949
10.	1.41
13.	3.56
16.	7.37
20.	17.3
25.	47.3
28.75 (max)	98.8

RMS % Error	Life Prediction Ratio Summary
12.79	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
37.04	0. .5 .8 1.25 2.

Figure 6.16.3.1.33

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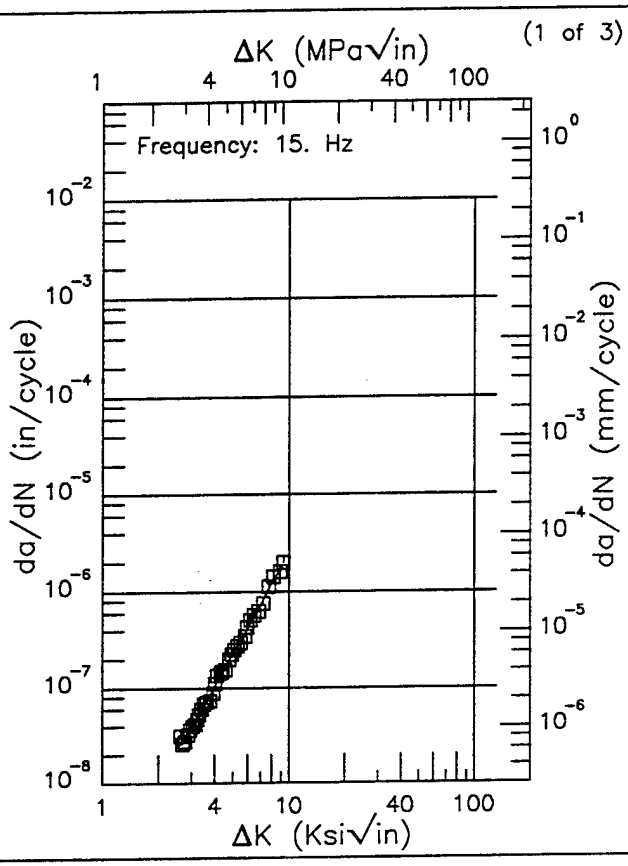
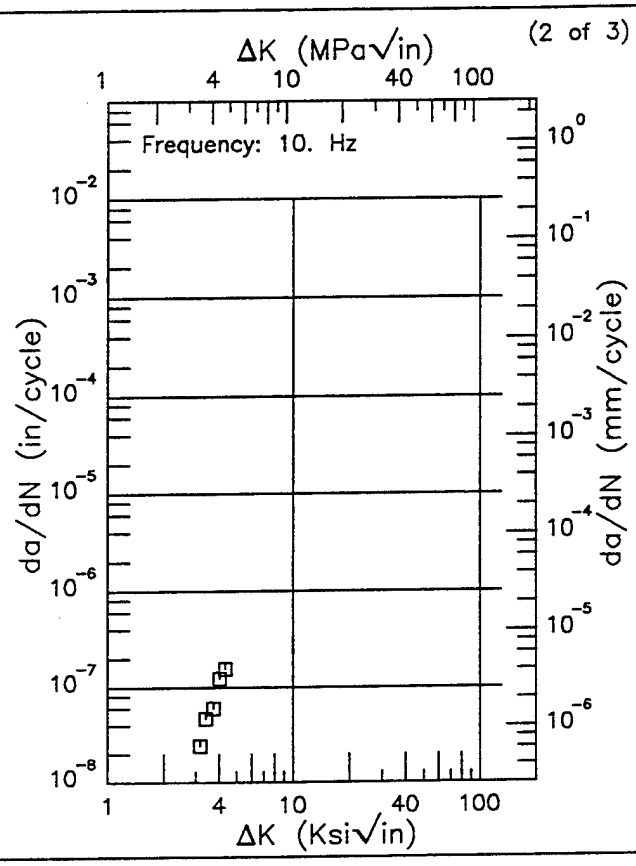
F

Ti–6Al–4V

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.8
Environment: LAB AIR; RT

Yield Strength: 140.1 – 144.9 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.25 in.
Specimen Width: 2.004 – 2.008 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
2.61 (min)	0.0256
3.	0.0369
3.5	0.0633
4.	0.105
5.	0.233
6.	0.425
7.	0.729
8.	1.24
9.	1.73
9.23 (max)	1.76

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.47	0. .5 .8 1.25 2.

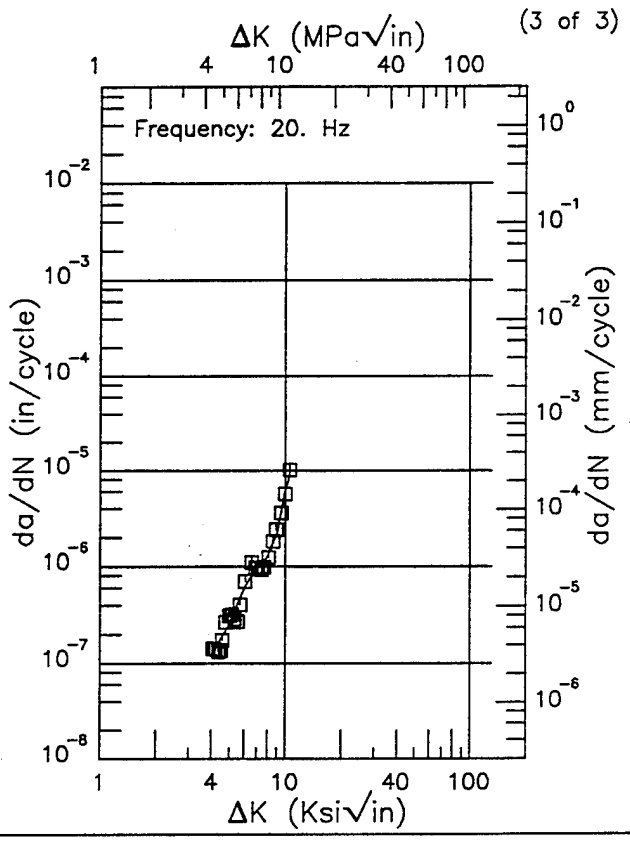
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

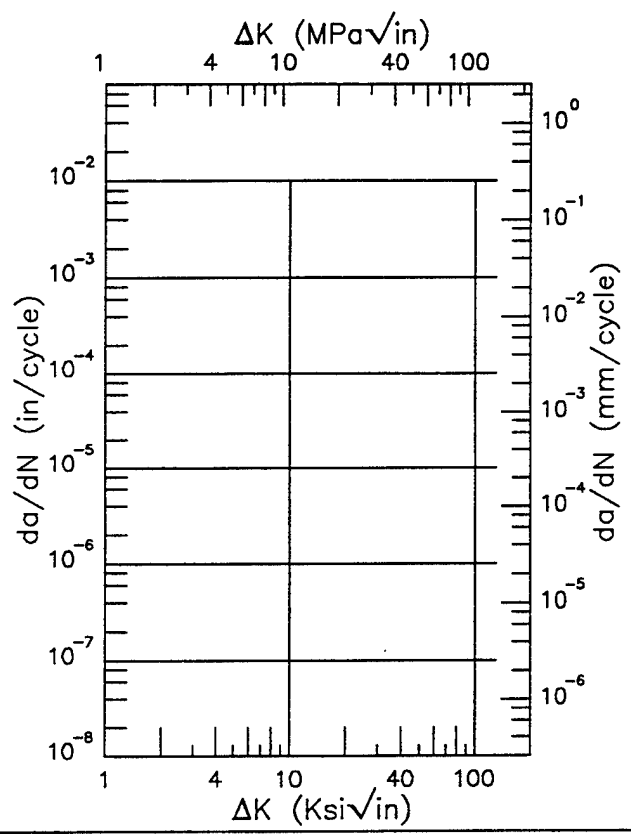
Figure 6.16.3.1.34

Ti–6Al–4V F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.8
Environment: LAB AIR; RT

Yield Strength: 140.1 – 144.9 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.25 in.
Specimen Width: 2.004 – 2.008 in.
Ref: DA006;DA007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.06 (min)	0.128
5.	0.254
6.	0.592
7.	0.986
8.	1.26
9.	2.22
10.	6.32
10.53 (max)	9.59

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 16.59

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

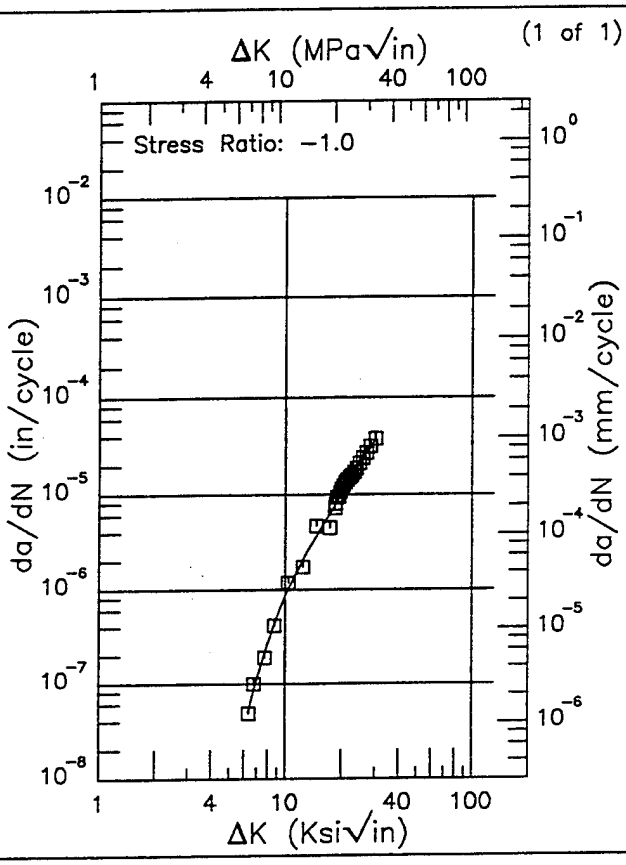
Figure 6.16.3.1.34 (Concluded)

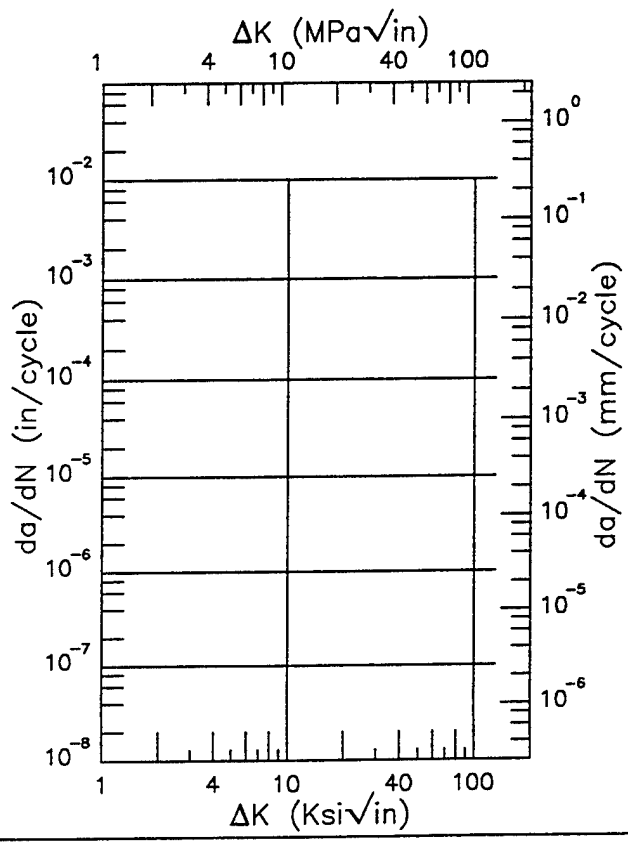
Ti–6Al–4V

R

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 5 Hz
Environment: LAB AIR; RT

Yield Strength: 131.7 ksi
Ult. Strength:
Specimen Thk: 0.205 in.
Specimen Width: 4.018 in.
Ref: DA006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.33 (min)	0.0501
7.	0.110
8.	0.268
9.	0.520
10.	0.868
13.	2.45
16.	4.89
20.	10.3
25.	21.9
30.	36.5
30.15 (max)	37.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.51	0. .5 .8 1.25 2.

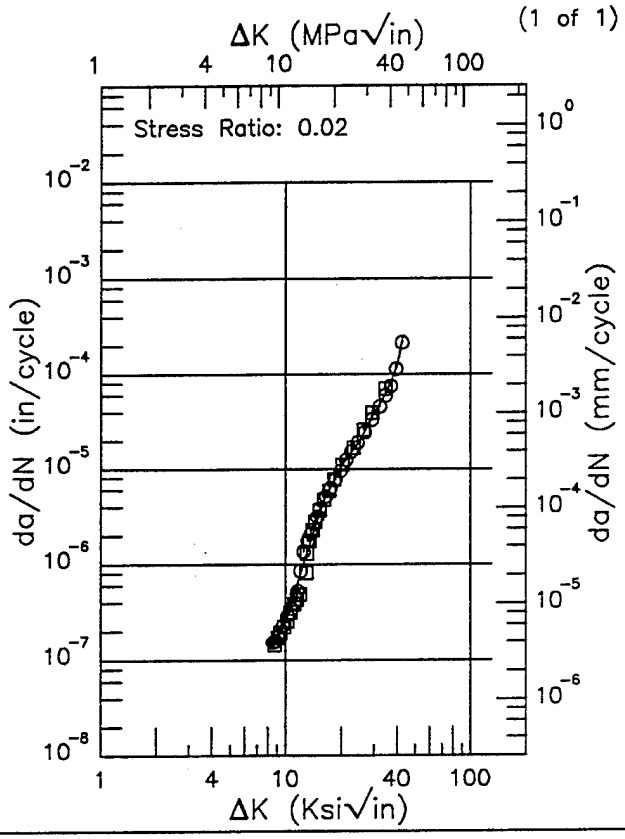
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

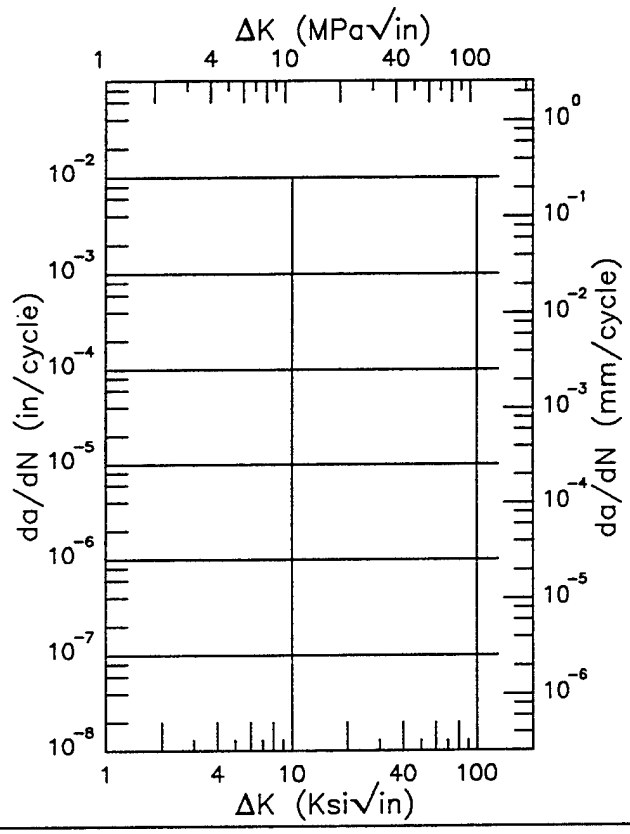
Figure 6.16.3.1.35

Ti–6Al–4V R

Condition/Ht: ANNEALED AT 1375F 3HRS AC
Form: 2.75 in. Plate
Specimen Type: WOL
Orientation: L–T
Frequency: 10 – 20 Hz
Environment: LAB AIR; RT

Yield Strength: 129 ksi
Ult. Strength: 139 ksi
Specimen Thk: 1.25 in.
Specimen Width: 5 in.
Ref: MA003





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.52 (min)	0.141
9.	0.162
10.	0.249
13.	1.26
16.	4.62
20.	11.0
25.	19.8
30.	37.9
35.	64.4
40.	122.
42.37 (max)	217.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 13.73

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

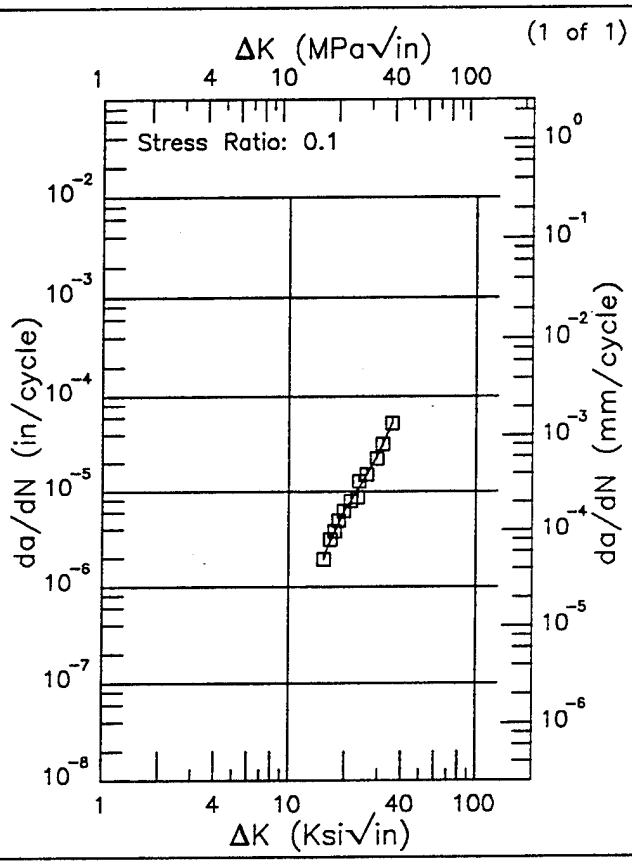
Figure 6.16.3.1.36

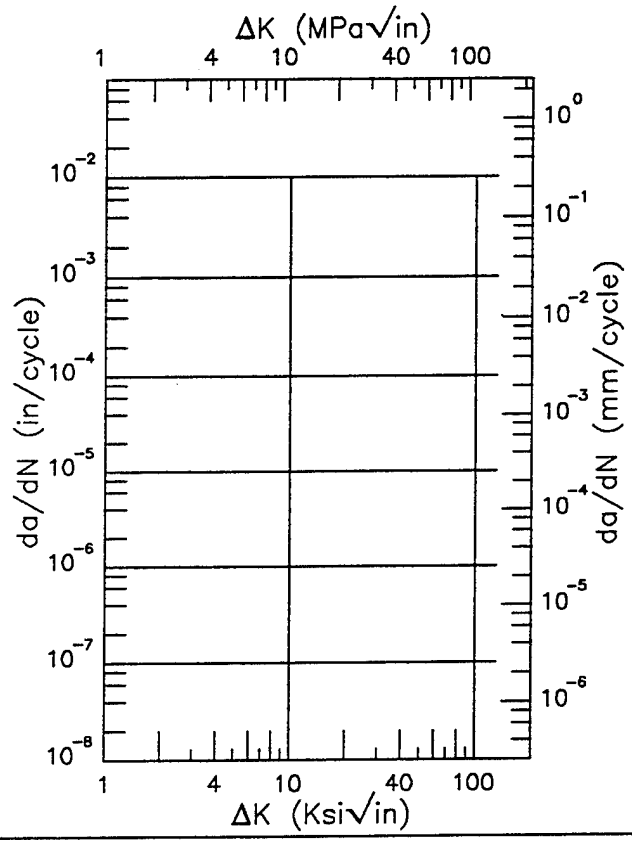
R

Ti–6Al–4V

Condition/Ht: AS WELDED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.35 (min)	1.98
16.	2.50
20.	6.52
25.	13.2
30.	24.7
35.	50.2
35.34 (max)	52.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.63	0. .5 .8 1.25 2.

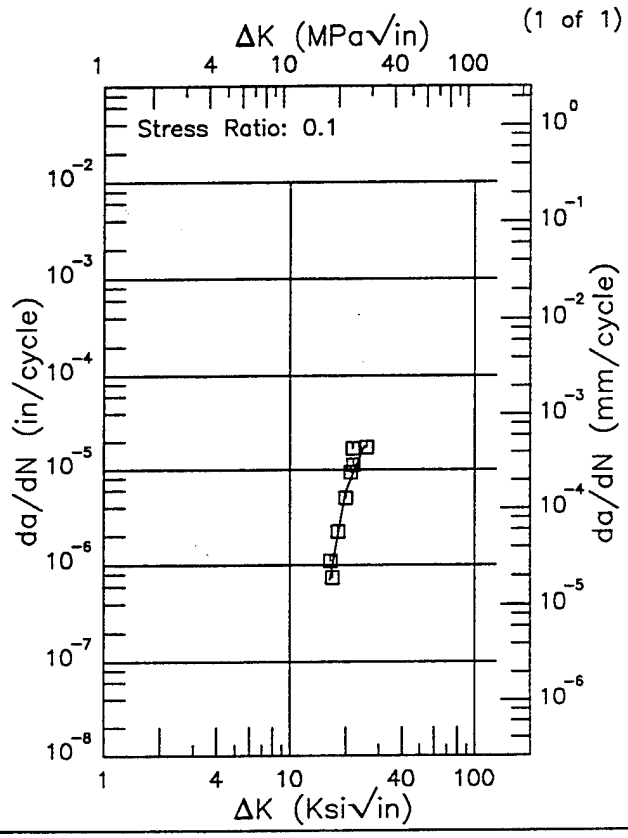
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

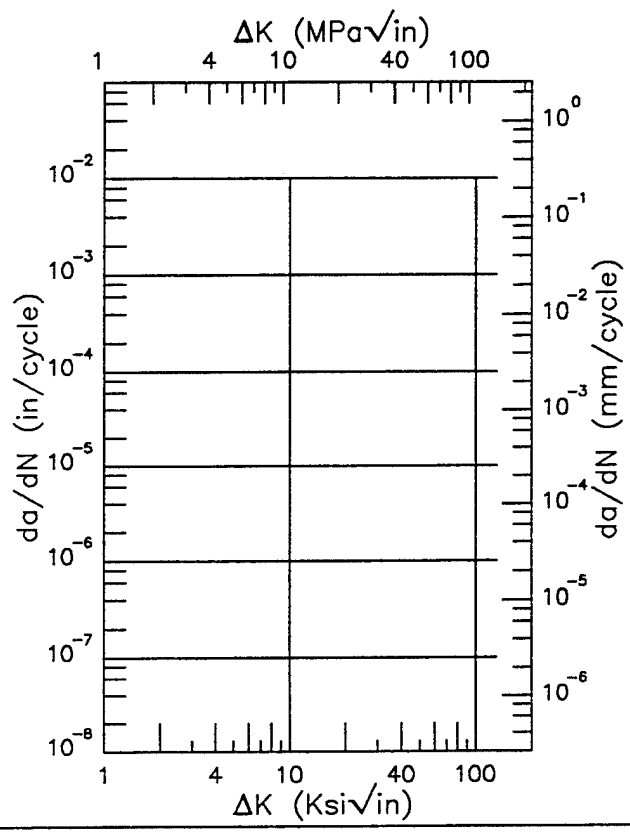
Figure 6.16.3.1.37

Ti–6Al–4V R

Condition/Ht: AS WELDED E.B. WELDMENT (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.39 (min)	0.700
20.	5.94
25.	18.0
25.65 (max)	17.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
40.92	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.38

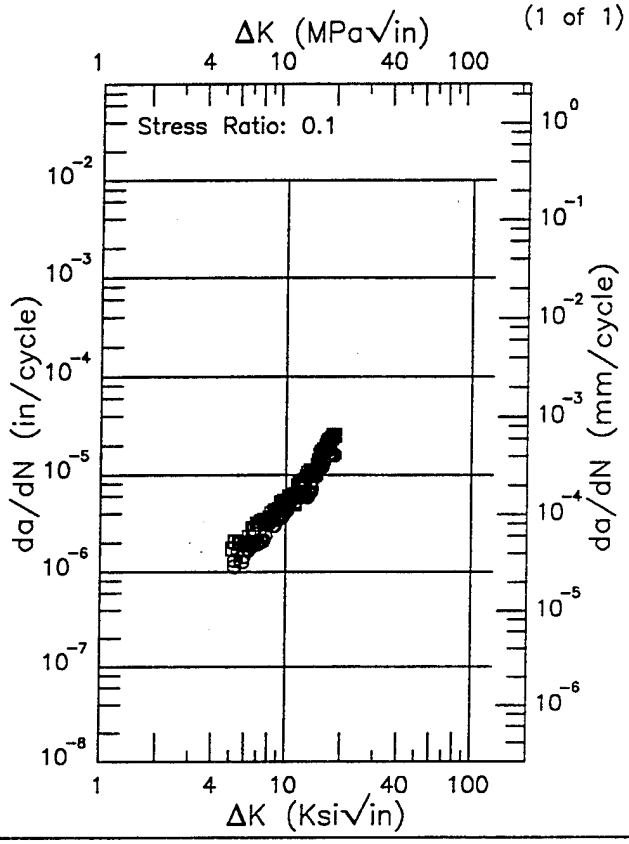
R

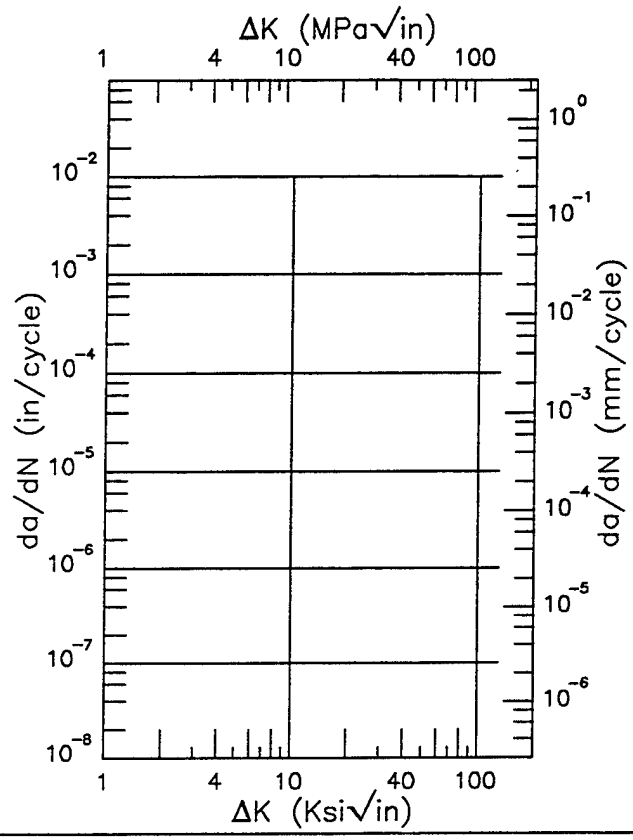
Ti–6Al–4V

Condition/Ht: BA
Form: 0.05 in. Sheet
Specimen Type: CT
Orientation:
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 130 ksi
Ult. Strength:
Specimen Thk: 0.05 in.
Specimen Width: 3.94 in.
Ref: NL001

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.13 (min)	1.45
6.	1.91
7.	2.47
8.	3.09
9.	3.81
10.	4.66
13.	8.43
16.	15.4
18.19 (max)	24.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
16.43	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.39

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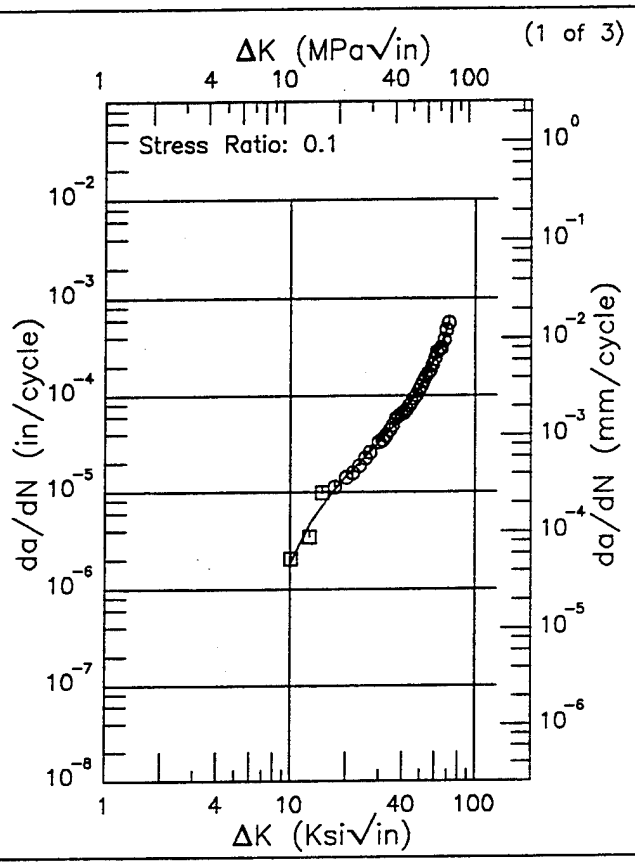
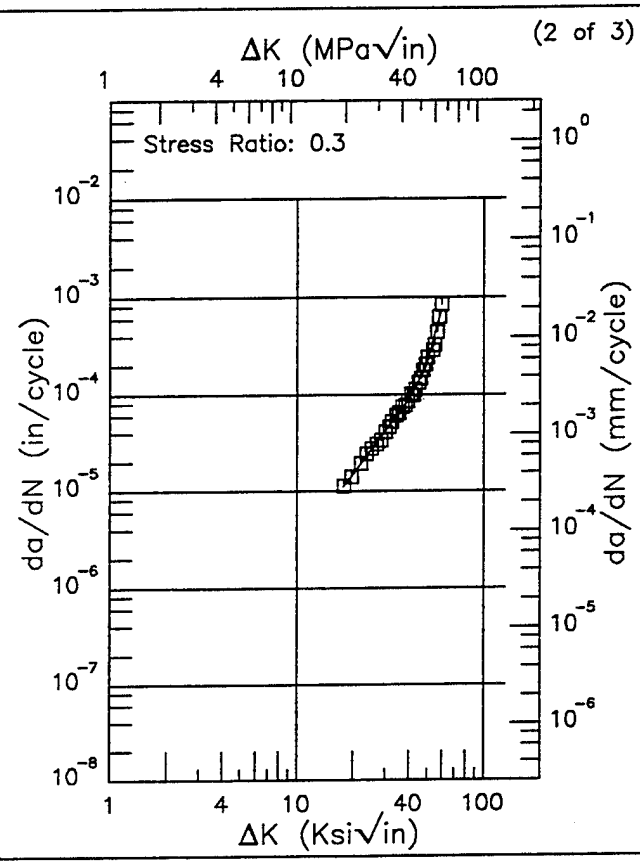
Ti–6Al–4V

R

Condition/Ht: BA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 130 ksi
Ult. Strength:
Specimen Thk: 0.05 in.
Specimen Width: 3.15 in.
Ref: NL001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.98 (min)	1.83
10.	1.84
13.	4.90
16.	8.75
20.	14.4
25.	22.5
30.	32.5
35.	45.8
40.	63.9
50.	122.
60.	234.
70.	485.
71.28 (max)	536.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.87 (min)	11.1
20.	14.9
25.	26.3
30.	41.6
35.	62.4
40.	90.5
50.	211.
59.74 (max)	732.

RMS % Error 8.49

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 7.35

Life Prediction Ratio Summary

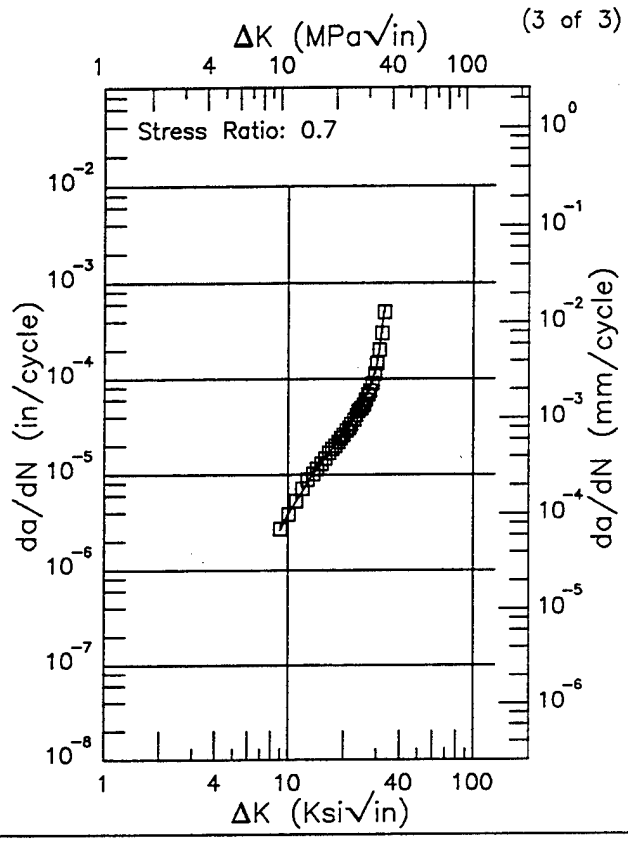
0. .5 .8 1.25 2.

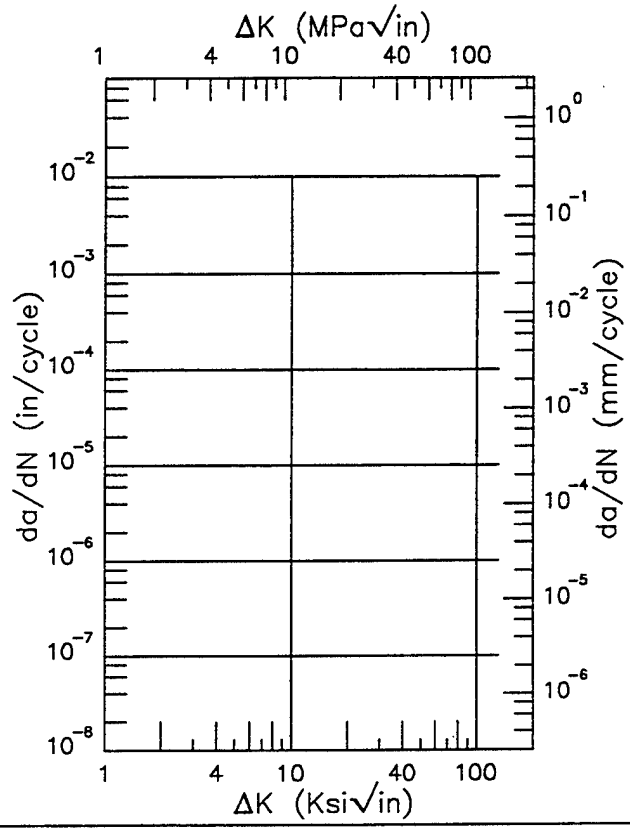
Figure 6.16.3.1.40

Ti–6Al–4V R

Condition/Ht: BA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 130 ksi
Ult. Strength:
Specimen Thk: 0.05 in.
Specimen Width: 3.15 in.
Ref: NL001





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.03 (min)	2.63
10.	3.87
13.	8.88
16.	15.3
20.	26.4
25.	50.5
30.	134.
33.00 (max)	515.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.36	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

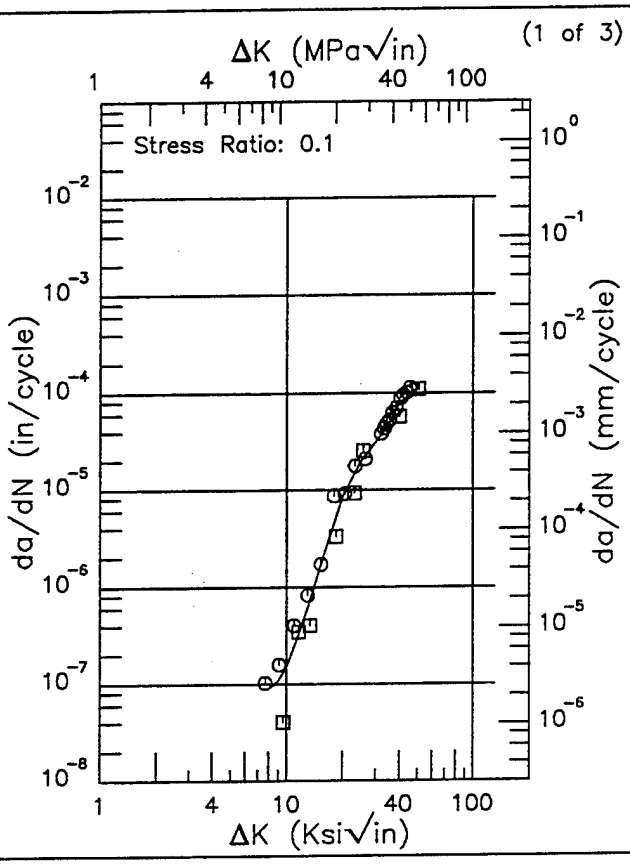
Figure 6.16.3.1.40 (Concluded)

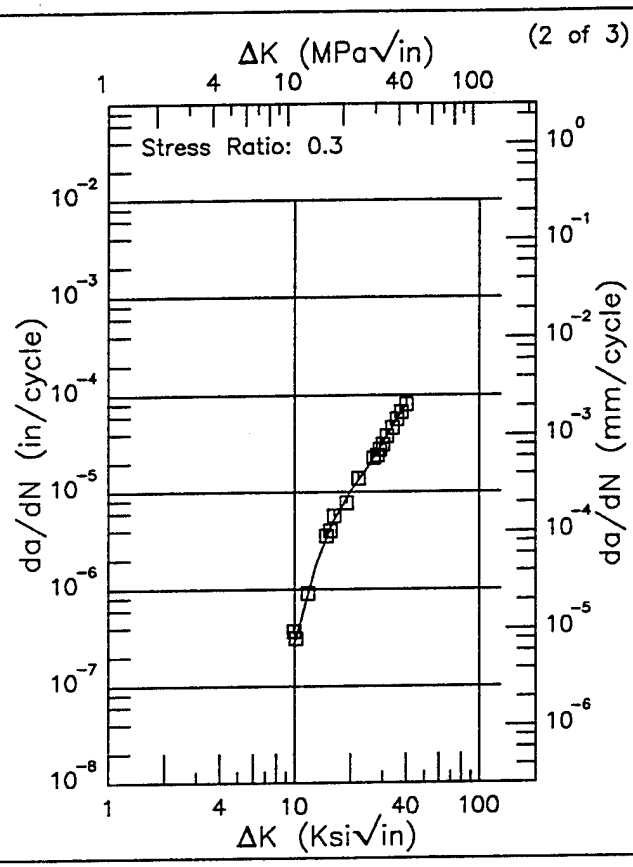
Ti–6Al–4V

R

Condition/Ht: BA
Form: 0.76 – 2.79 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 116.3 ksi
Ult. Strength: 125.7 ksi
Specimen Thk: 0.747 – 0.762 in.
Specimen Width: 4.993 – 5.008 in.
Ref: 88575



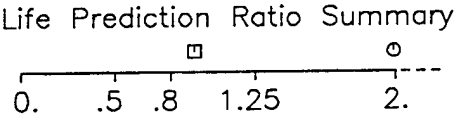


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.64 (min)	0.0896
8.	0.0896
9.	0.107
10.	0.152
13.	0.607
16.	2.29
20.	8.39
25.	19.8
30.	31.0
35.	47.4
40.	78.6
50.	111.
50.68 (max)	108.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.89 (min)	0.265
10.	0.290
13.	1.73
16.	4.79
20.	10.1
25.	18.3
30.	31.9
35.	52.9
39.92 (max)	79.6

RMS % Error 32.89

Life Prediction Ratio Summary



RMS % Error 10.64

Life Prediction Ratio Summary

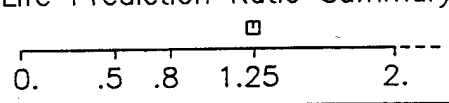


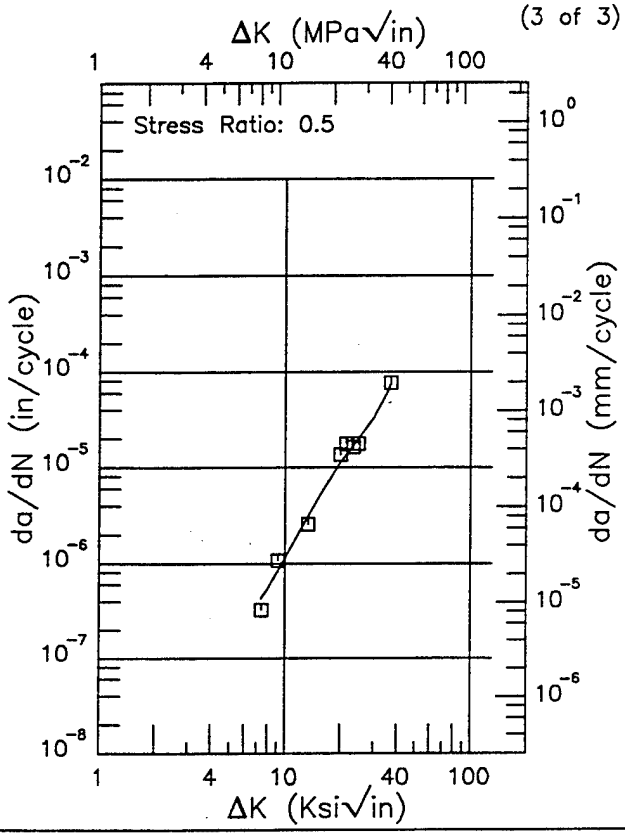
Figure 6.16.3.1.41

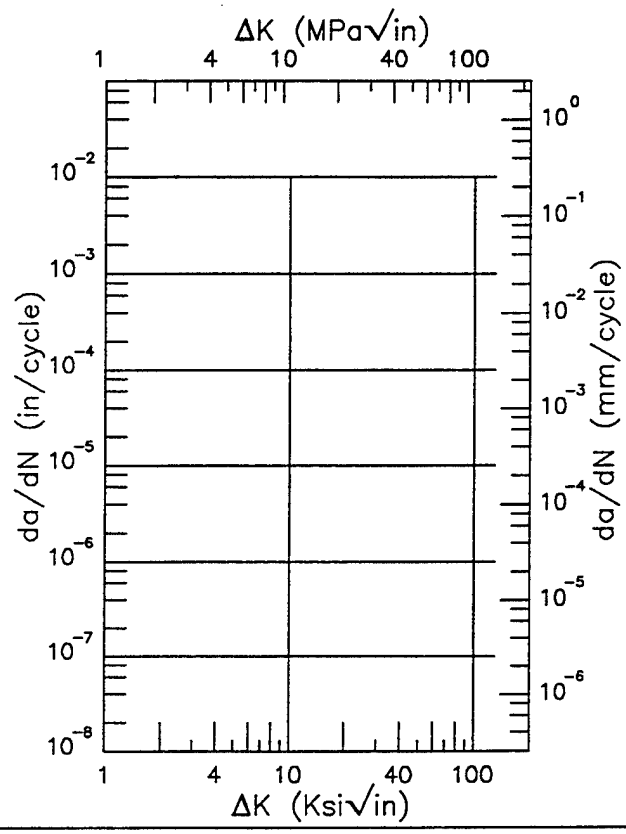
Ti–6Al–4V R

Condition/Ht: BA
Form: 0.76 – 2.79 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 116.3 ksi
Ult. Strength: 125.7 ksi
Specimen Thk: 0.747 – 0.762 in.
Specimen Width: 4.993 – 5.008 in.
Ref: 88575

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.43 (min)	0.428
8.	0.541
9.	0.800
10.	1.15
13.	2.86
16.	5.76
20.	11.4
25.	20.2
30.	33.0
35.	58.5
36.97 (max)	75.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
19.61	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

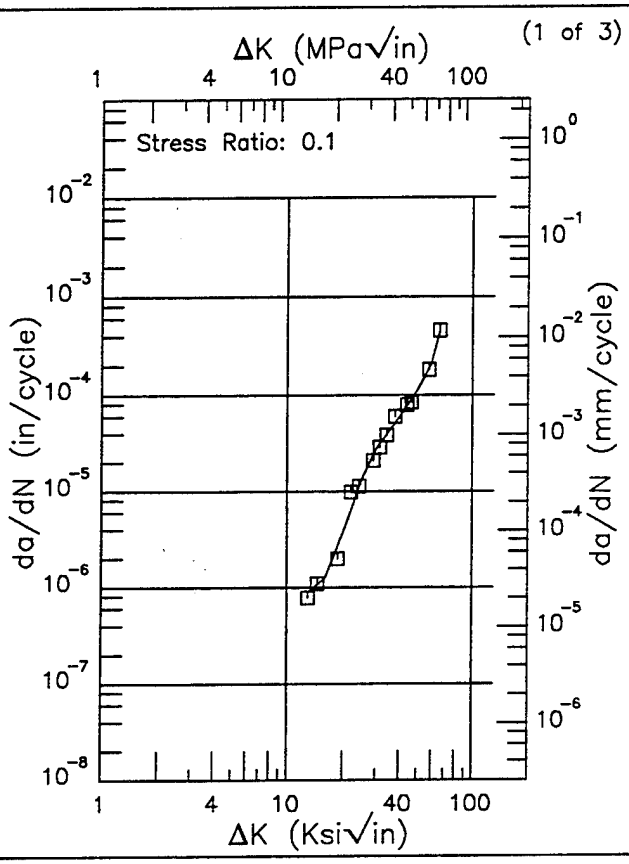
Figure 6.16.3.1.41 (Concluded)

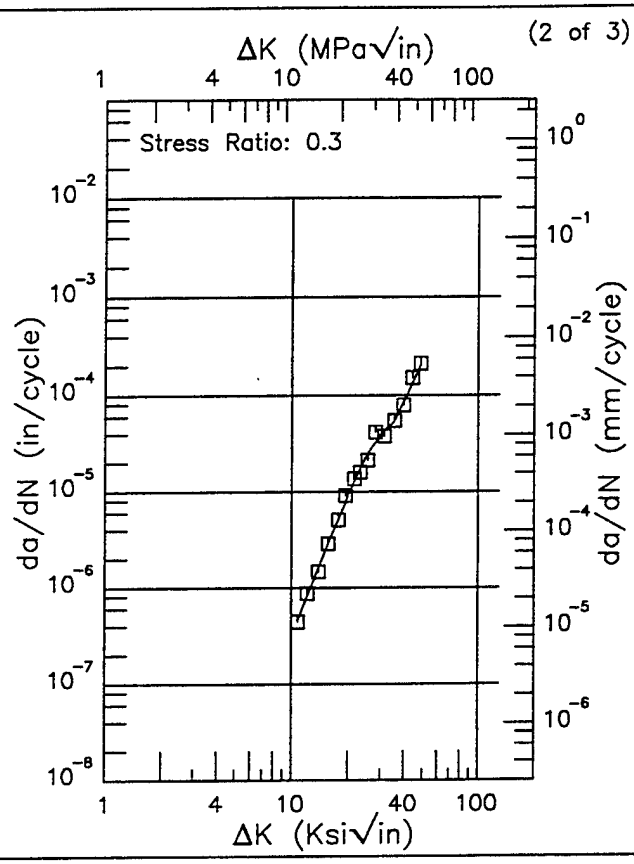
R

Ti–6Al–4V

Condition/Ht: BA
Form: 2.25 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 0.1 Hz
Environment: H.H.A.; RT

Yield Strength: 117 ksi
Ult. Strength: 129.4 ksi
Specimen Thk: 0.749 – 0.753 in.
Specimen Width: 5.009 – 5.013 in.
Ref: GD007



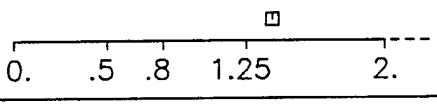


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.84 (min)	0.891
13.	0.881
16.	1.25
20.	3.75
25.	13.0
30.	27.4
35.	42.3
40.	59.3
50.	112.
60.	217.
66.20 (max)	454.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.82 (min)	0.464
13.	1.13
16.	3.17
20.	9.28
25.	23.4
30.	39.1
35.	52.2
40.	86.6
48.80 (max)	210.

RMS % Error 17.91

Life Prediction Ratio Summary



RMS % Error 11.30

Life Prediction Ratio Summary

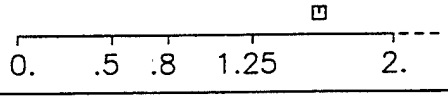


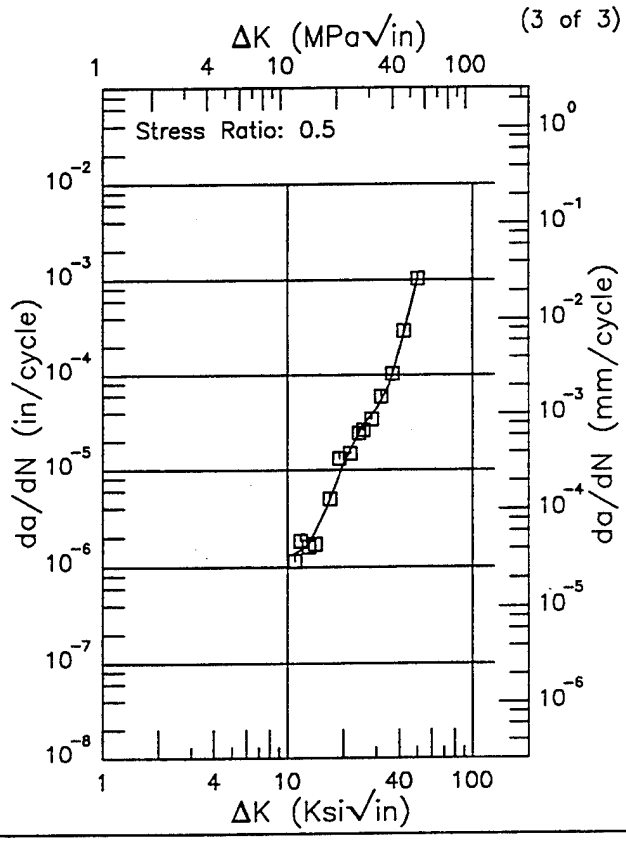
Figure 6.16.3.1.42

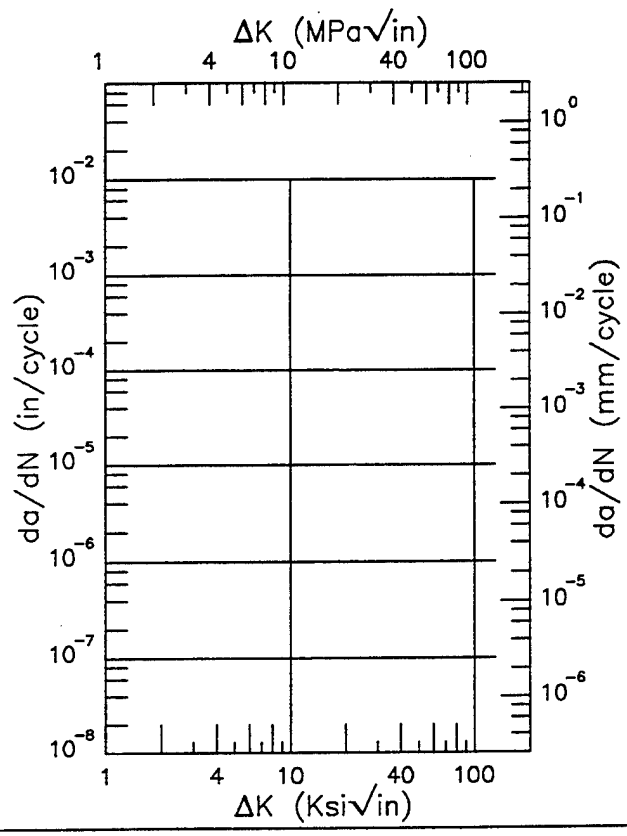
Ti–6Al–4V R

Condition/Ht: BA
Form: 2.25 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 0.1 Hz
Environment: H.H.A.; RT

Yield Strength: 117 ksi
Ult. Strength: 129.4 ksi
Specimen Thk: 0.749 – 0.753 in.
Specimen Width: 5.009 – 5.013 in.
Ref: GD007

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.92 (min)	1.37
13.	1.68
16.	3.80
20.	11.7
25.	28.3
30.	43.9
35.	76.9
40.	189.
50.	1000.
50.10 (max)	1010.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 16.42

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

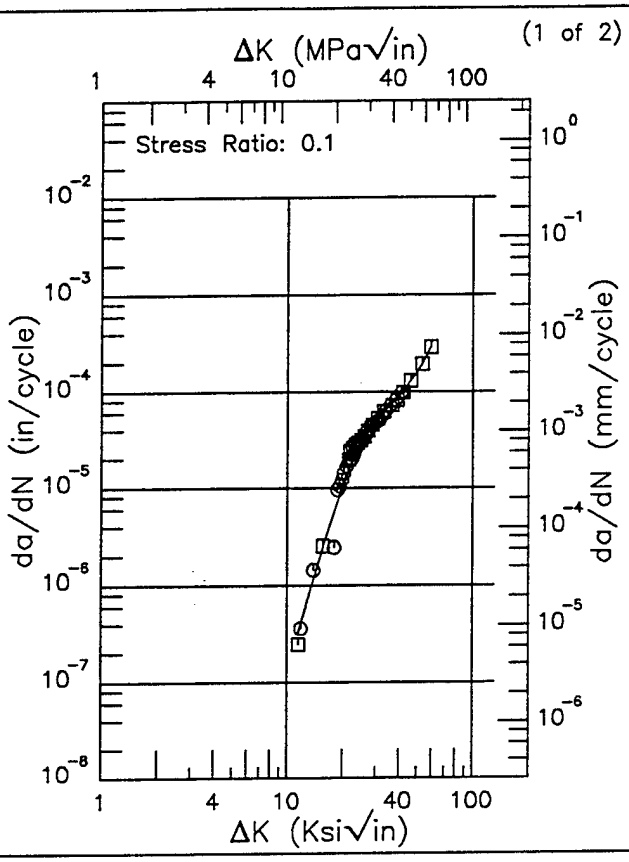
Figure 6.16.3.1.42 (Concluded)

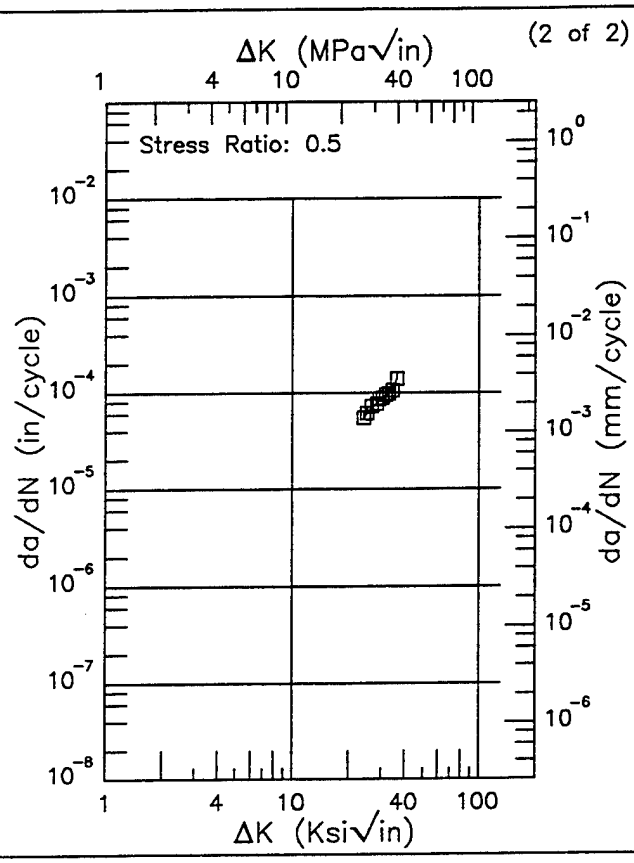
Ti–6Al–4V

R

Condition/Ht: BA
Form: 0.75 – 0.76 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 116.3 ksi
Ult. Strength: 125.7 ksi
Specimen Thk: 0.746 – 0.751 in.
Specimen Width: 4.986 – 5.019 in.
Ref: 88575





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.43 (min)	0.326
13.	0.735
16.	2.87
20.	11.0
25.	30.0
30.	50.1
35.	69.1
40.	89.9
50.	161.
59.09 (max)	286.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
24.08 (min)	53.9
25.	61.7
30.	87.4
35.	114.
36.06 (max)	139.

RMS % Error	Life Prediction Ratio Summary
18.47	0. .5 .8 1.25 2.

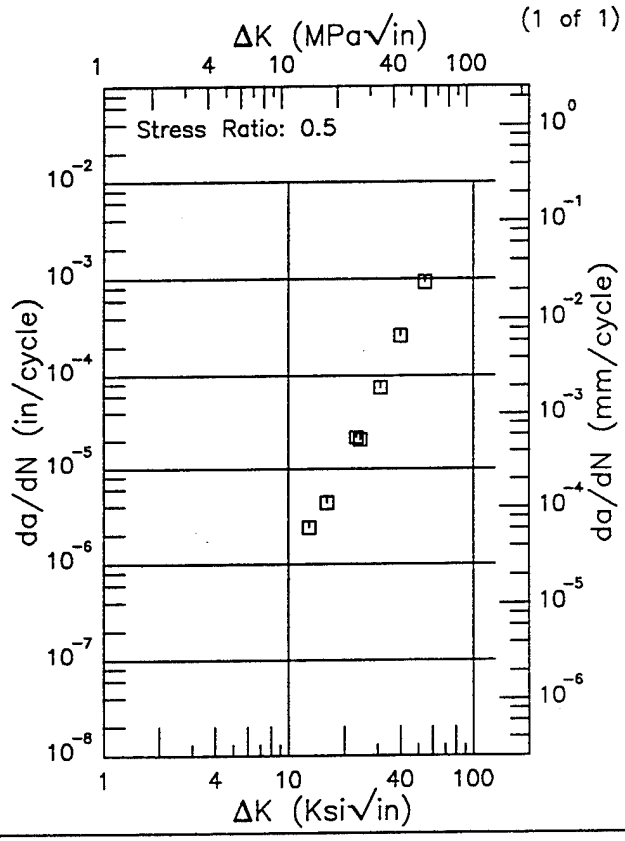
RMS % Error	Life Prediction Ratio Summary
2.55	0. .5 .8 1.25 2.

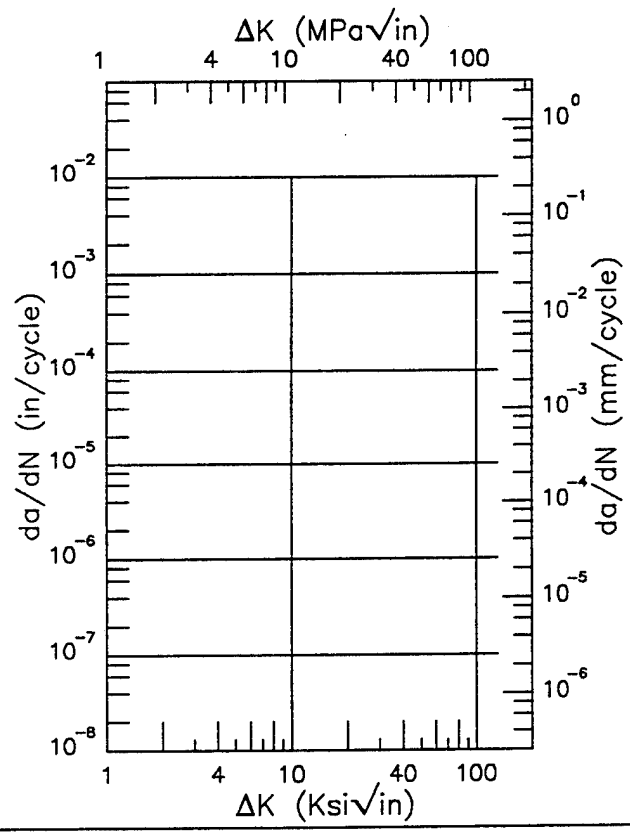
Figure 6.16.3.1.43

Ti–6Al–4V R

Condition/Ht: BA
Form: 0.75 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 0.1 Hz
Environment: S.T.W.; RT

Yield Strength: 116.3 ksi
Ult. Strength: 125.7 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.008 in.
Ref: 88575





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

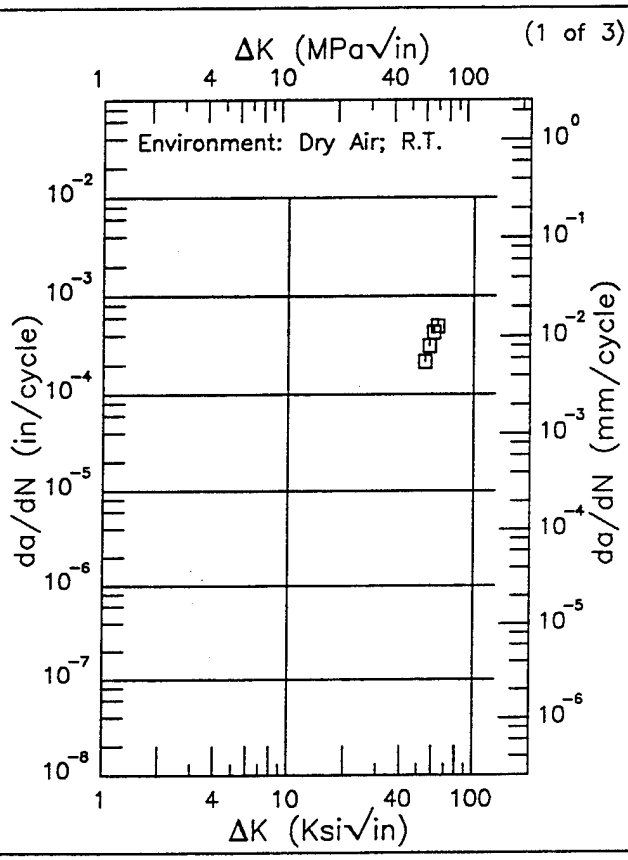
Figure 6.16.3.1.44

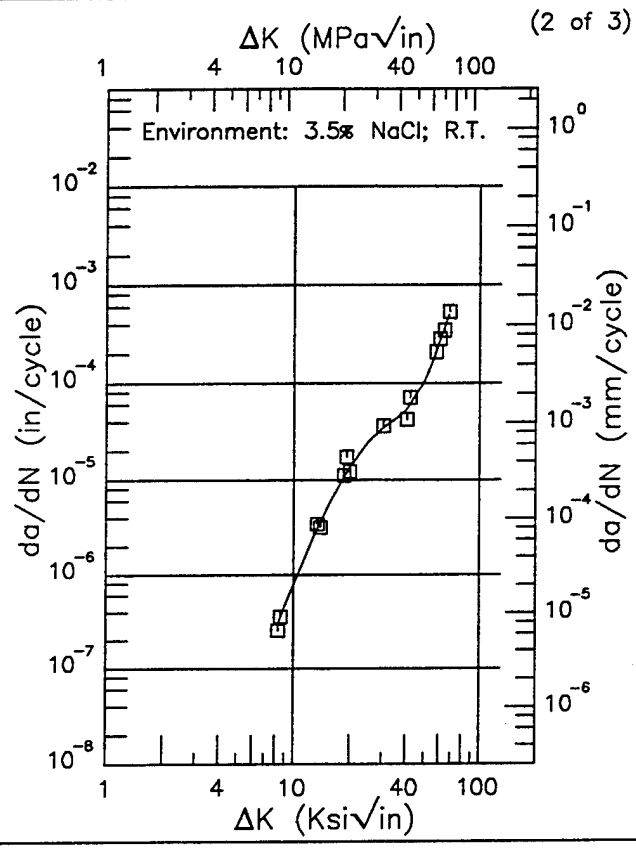
Ti–6Al–4V

E

Condition/Ht: BA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 124.5 ksi
Ult. Strength: 136.4 ksi
Specimen Thk: 0.66 in.
Specimen Width: 2.55 – 2.554 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.24 (min)	0.294
9.	0.464
10.	0.787
13.	2.69
16.	6.31
20.	13.6
25.	24.6
30.	34.1
35.	42.0
40.	52.4
50.	103.
60.	254.
68.19 (max)	499.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

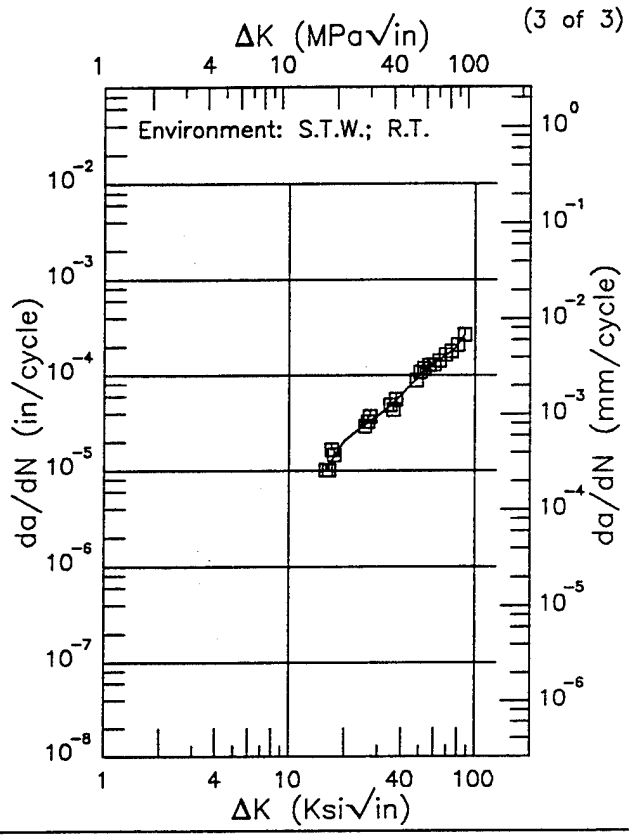
RMS % Error	Life Prediction Ratio Summary
16.33	0. .5 .8 1.25 2.

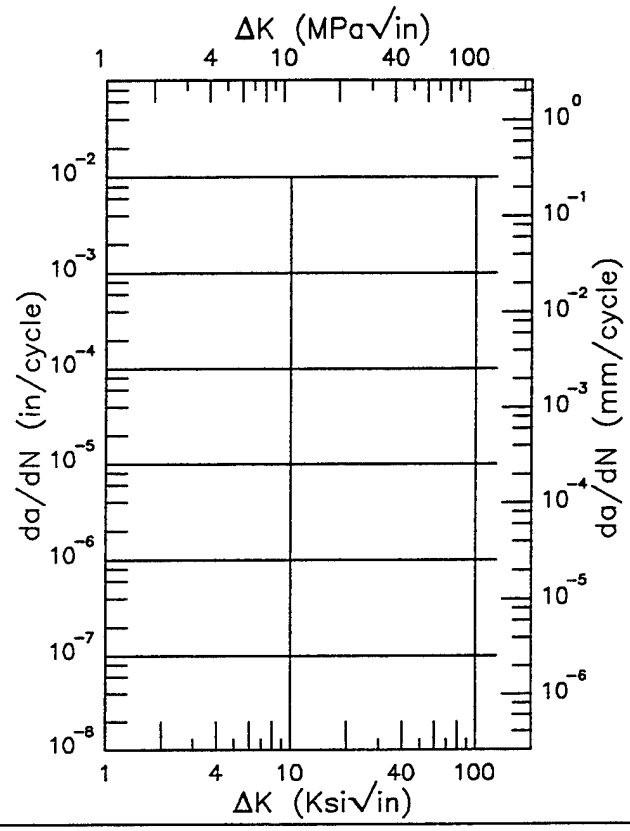
Figure 6.16.3.1.45

Ti–6Al–4V E

Condition/Ht: BA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 124.5 ksi
Ult. Strength: 136.4 ksi
Specimen Thk: 0.66 in.
Specimen Width: 2.55 – 2.554 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.85 (min)	10.2
16.	10.6
20.	20.7
25.	29.9
30.	37.6
35.	47.7
40.	62.1
50.	98.9
60.	133.
70.	164.
80.	205.
87.57 (max)	264.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 9.22

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

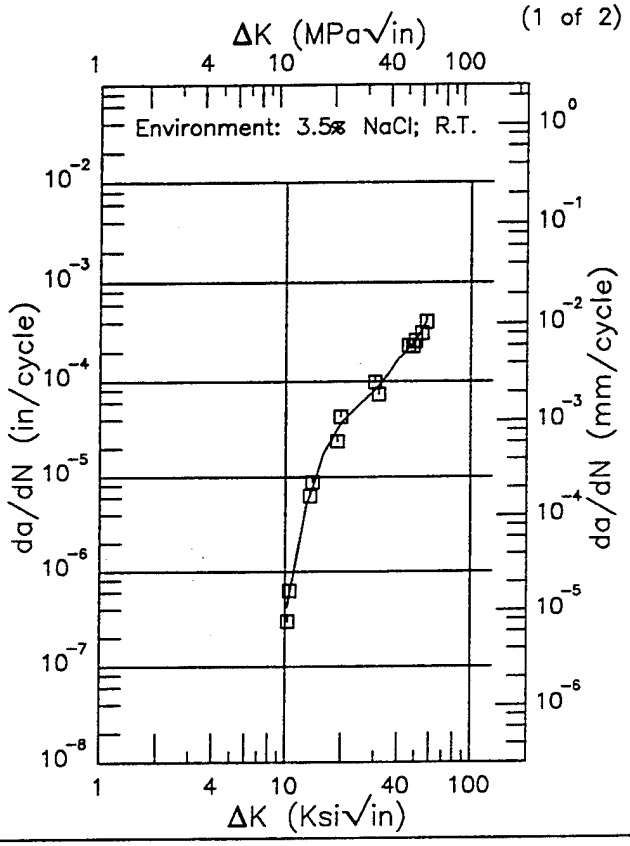
Figure 6.16.3.1.45 (Concluded)

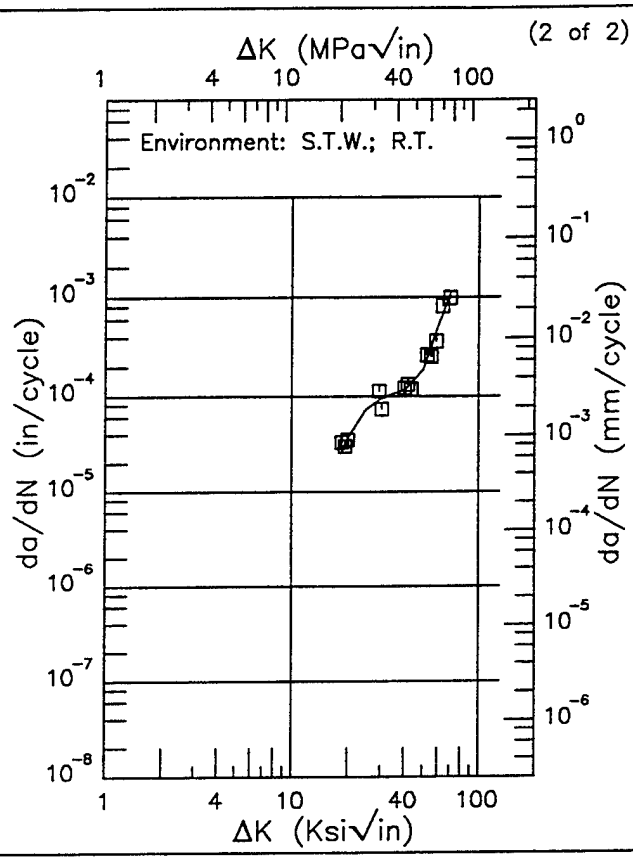
Ti–6Al–4V

E

Condition/Ht: BA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength: 124.5 ksi
Ult. Strength: 136.4 ksi
Specimen Thk: 0.66 in.
Specimen Width: 2.55 – 2.554 in.
Ref: 90981



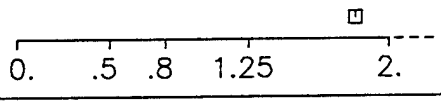


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.21 (min)	0.423
13.	4.99
16.	17.5
20.	37.4
25.	58.6
30.	81.2
35.	115.
40.	165.
50.	256.
57.34 (max)	396.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.51 (min)	25.4
20.	36.7
25.	72.5
30.	94.5
35.	106.
40.	115.
50.	185.
60.	502.
69.64 (max)	1052.

RMS % Error 15.95

Life Prediction Ratio Summary



RMS % Error 16.82

Life Prediction Ratio Summary

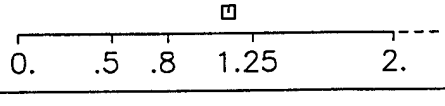
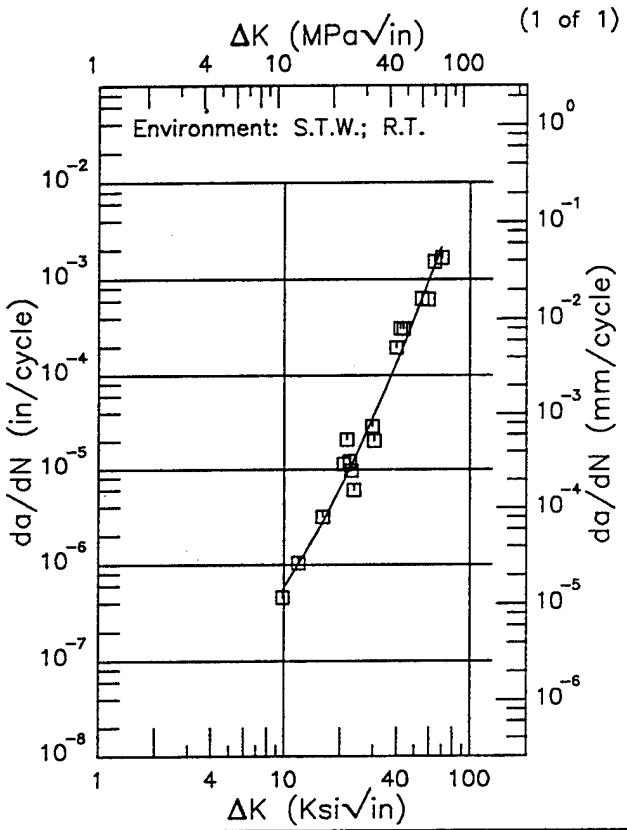


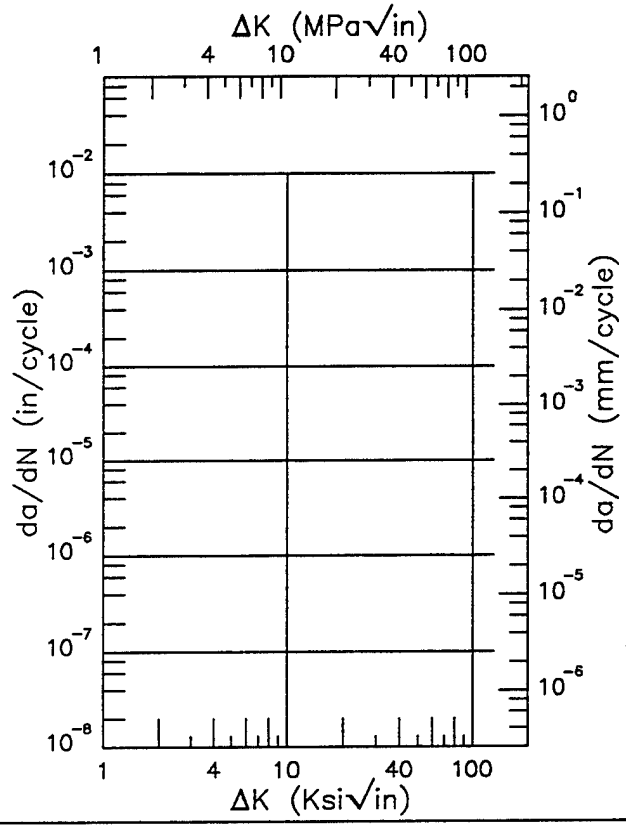
Figure 6.16.3.1.46

Ti–6Al–4V E

Condition/Ht: BA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Frequency: 0.1 Hz

Yield Strength: 124.5 ksi
Ult. Strength: 136.4 ksi
Specimen Thk: 0.66 in.
Specimen Width: 2.55 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.81 (min)	0.550
10.	0.581
13.	1.31
16.	2.73
20.	6.43
25.	16.2
30.	36.1
35.	72.9
40.	136.
50.	400.
60.	987.
69.91 (max)	2127.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 47.90

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

Figure 6.16.3.1.47

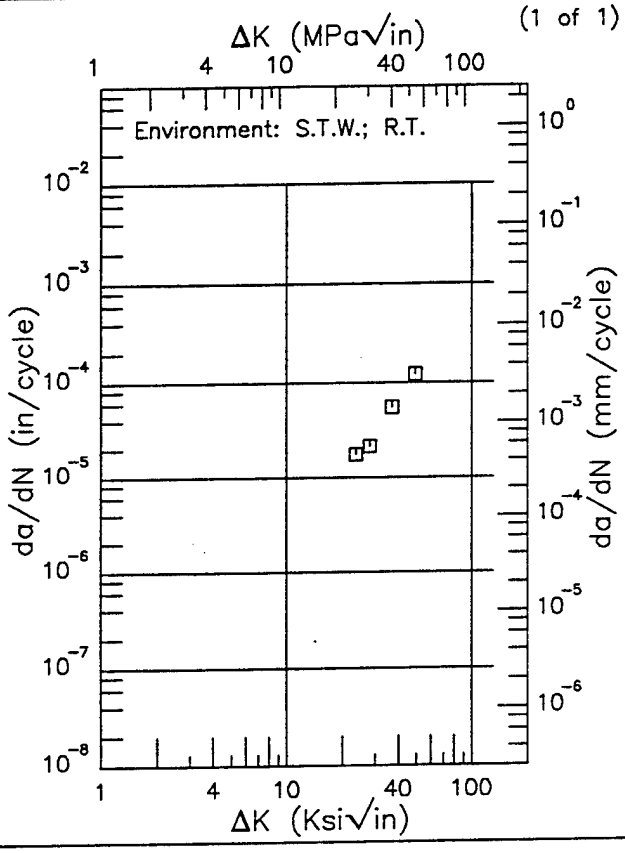
Ti–6Al–4V

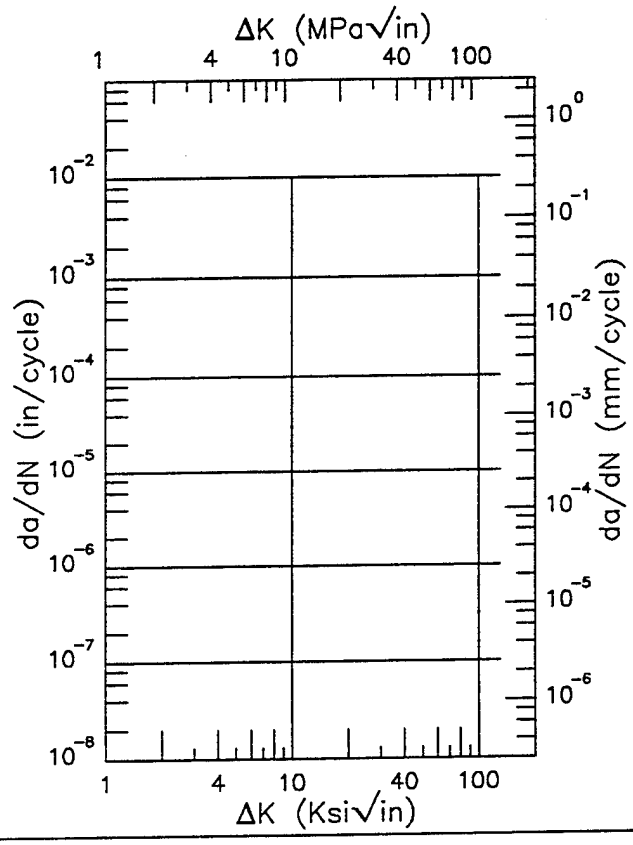
E

Condition/Ht: BA
Form: 2.79 in. Plate
Specimen Type: CT
Orientation: S–L
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength: 116.3 ksi
Ult. Strength: 125.7 ksi
Specimen Thk: 1.002 in.
Specimen Width: 1.996 in.
Ref: 88575

(1 of 1)





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

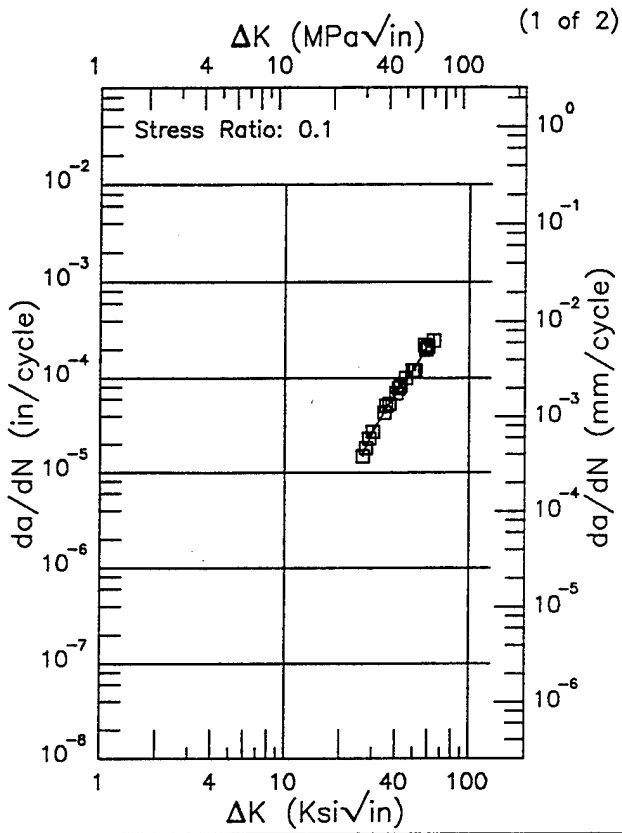
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

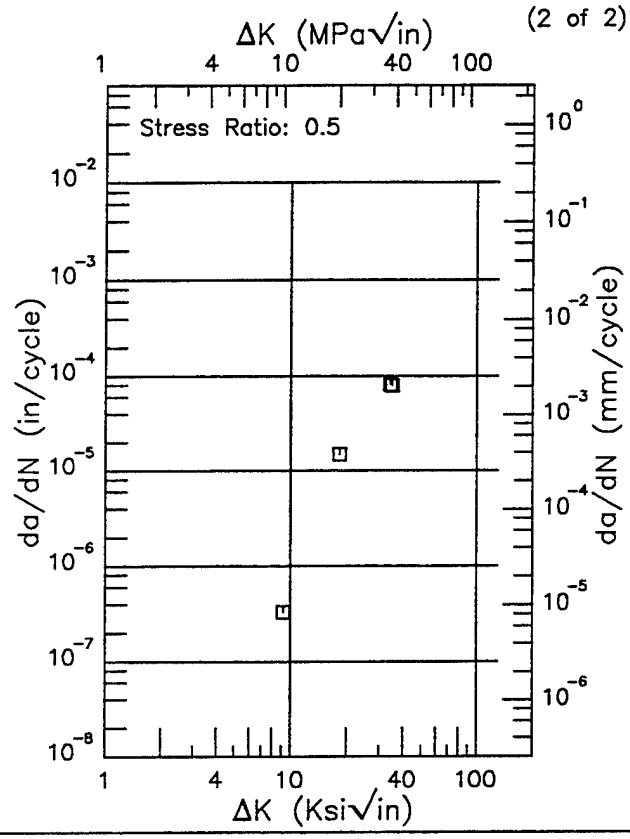
Figure 6.16.3.1.48

Ti–6Al–4V R

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Frequency: 0.1 Hz
Environment: DIST WATER; RT

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.53 (min)	15.4
30.	26.2
35.	46.0
40.	68.0
50.	123.
60.	227.
63.96 (max)	244.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.25	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.49

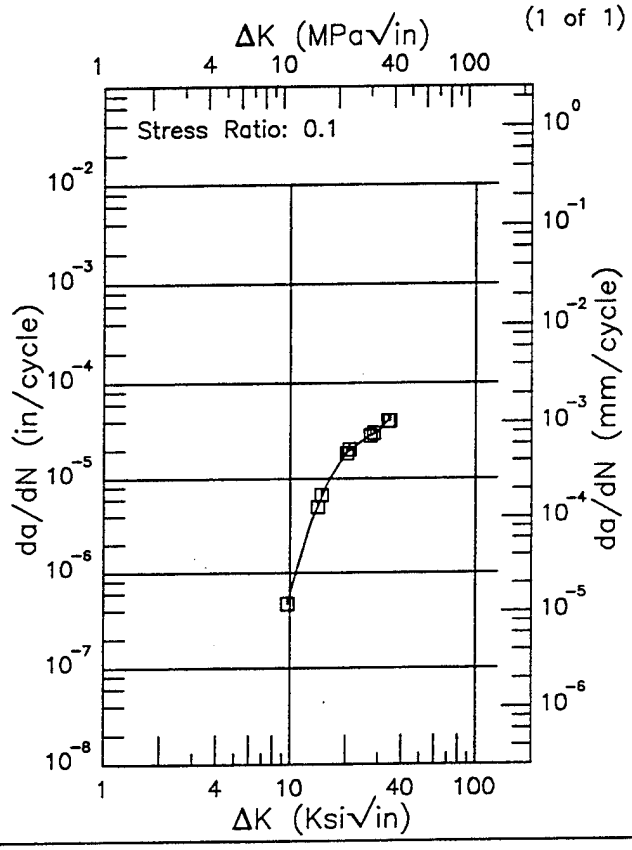
Ti–6Al–4V

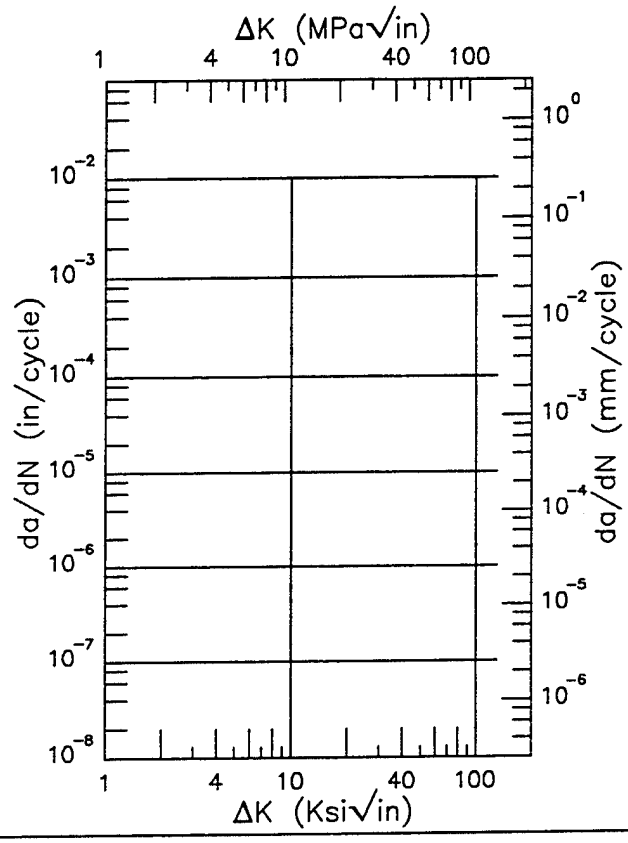
R

Condition/Ht: BA
Form: 0.63 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: T–S
Frequency: 10 Hz
Environment: 3.5% NACL; RT

Yield Strength: 124.5 ksi
Ult. Strength: 136.4 ksi
Specimen Thk: 0.672 in.
Specimen Width: 1.5 in.
Ref: 90981

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.65 (min)	0.468
10.	0.619
13.	3.48
16.	9.24
20.	18.4
25.	26.0
30.	31.8
34.71 (max)	42.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
3.51	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.50

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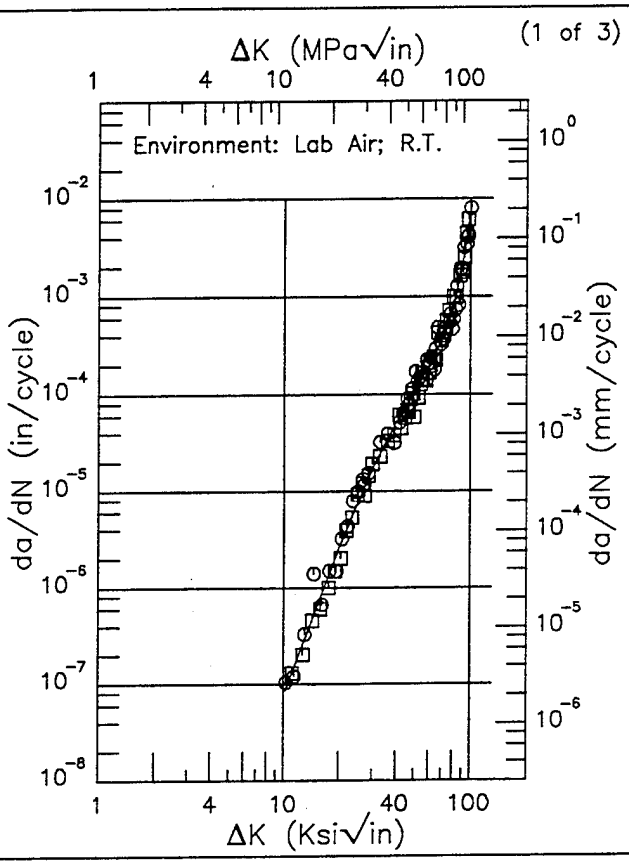
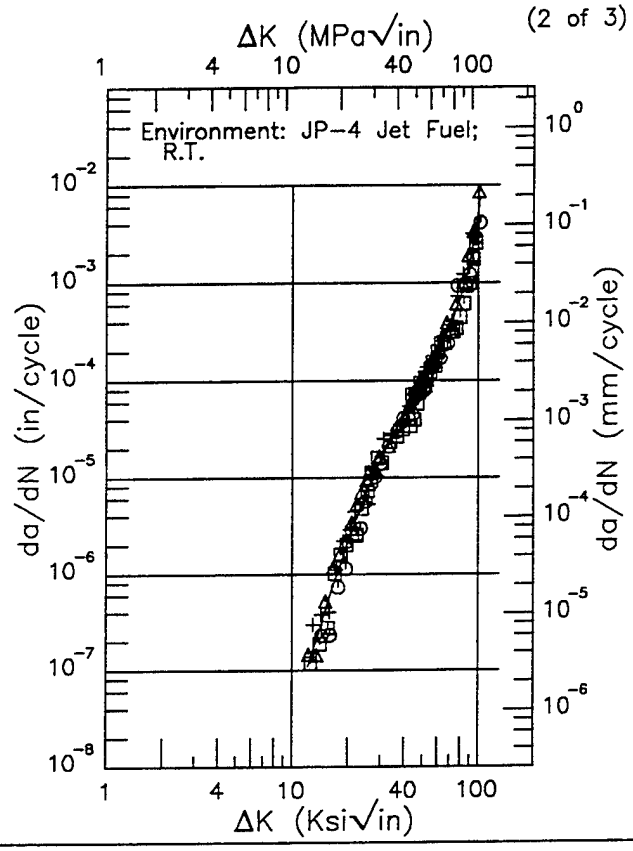
Ti–6Al–4V

E

Condition/Ht: BA
Form: 1.3 in. Forging
Specimen Type: WOL
Orientation: L–T
Stress Ratio: 0.02
Frequency: 0.1 – 20 Hz

Yield Strength: 111 – 111.5 ksi
Ult. Strength: 122.5 – 127.5 ksi
Specimen Thk: 1.25 in.
Specimen Width: 5 in.
Ref: MA005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.25 (min)	0.0857
13.	0.285
16.	0.828
20.	2.55
25.	7.46
30.	16.8
35.	31.4
40.	51.2
50.	105.
60.	193.
70.	356.
80.	724.
90.	1946.
99.83 (max)	7407.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.23 (min)	0.109
13.	0.161
16.	0.581
20.	2.11
25.	6.74
30.	15.5
35.	28.5
40.	44.9
50.	91.5
60.	175.
70.	341.
80.	680.
90.	1542.
100.	5517.
101.83 (max)	7448.

RMS % Error	Life Prediction Ratio Summary
26.85	0. .5 .8 1.25 2.

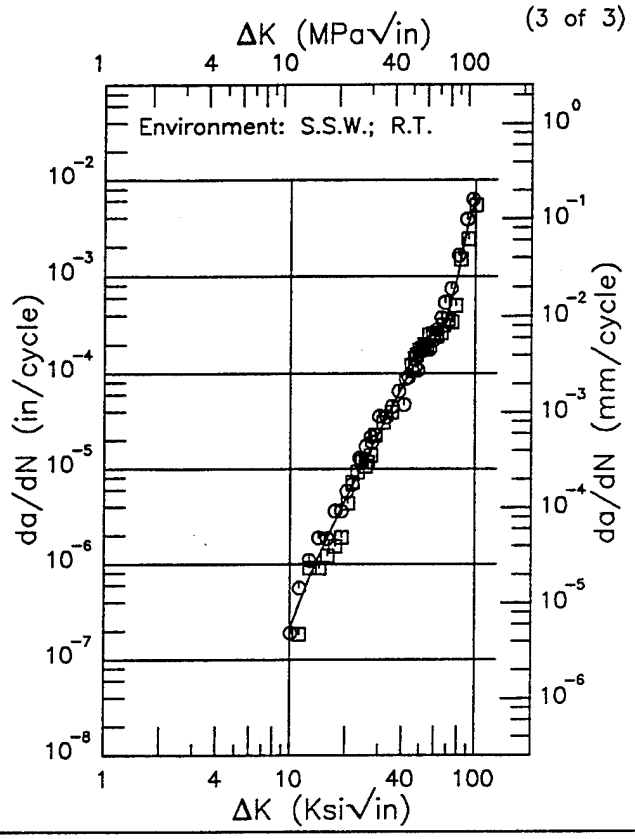
RMS % Error	Life Prediction Ratio Summary
25.48	0. .5 .8 1.25 2.

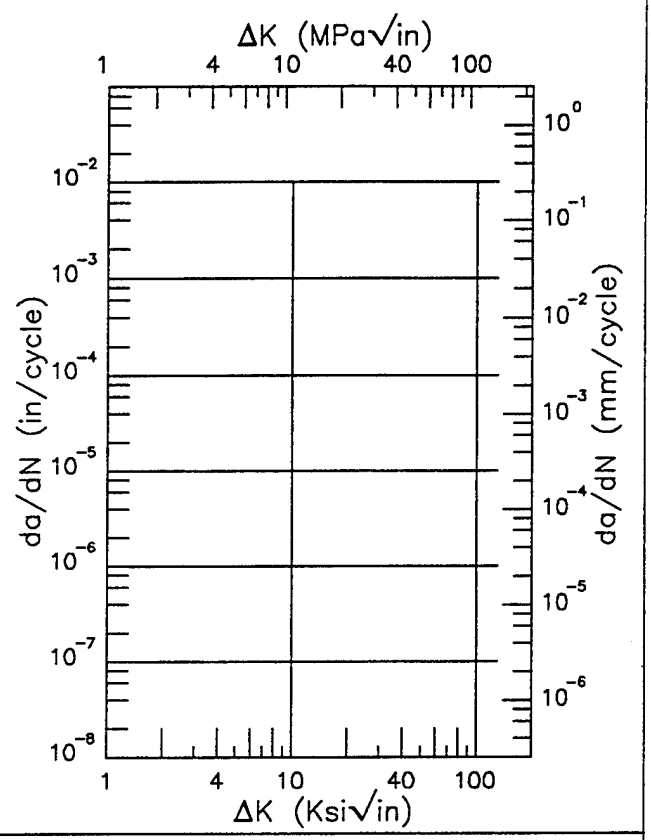
Figure 6.16.3.1.51

Ti–6Al–4V E

Condition/Ht: BA
Form: 1.3 in. Forging
Specimen Type: WOL
Orientation: L–T
Stress Ratio: 0.02
Frequency: 0.1 – 20 Hz

Yield Strength: 111 – 111.5 ksi
Ult. Strength: 122.5 – 127.5 ksi
Specimen Thk: 1.25 in.
Specimen Width: 5 in.
Ref: MA005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.06 (min)	0.223
13.	0.775
16.	1.93
20.	4.83
25.	11.6
30.	23.6
35.	43.3
40.	72.7
50.	154.
60.	238.
70.	392.
80.	1007.
90.	3207.
99.93 (max)	6205.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 25.94

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

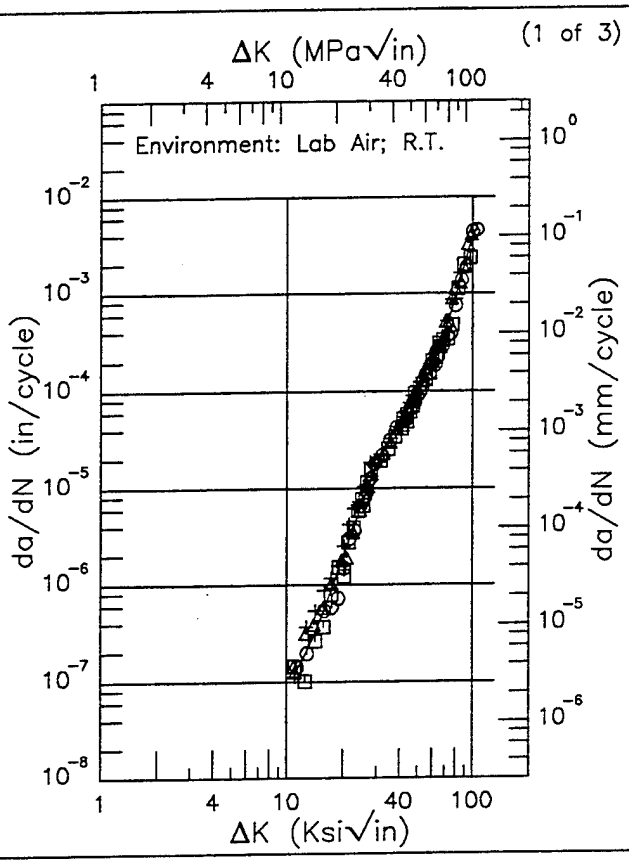
Figure 6.16.3.1.51 (Concluded)

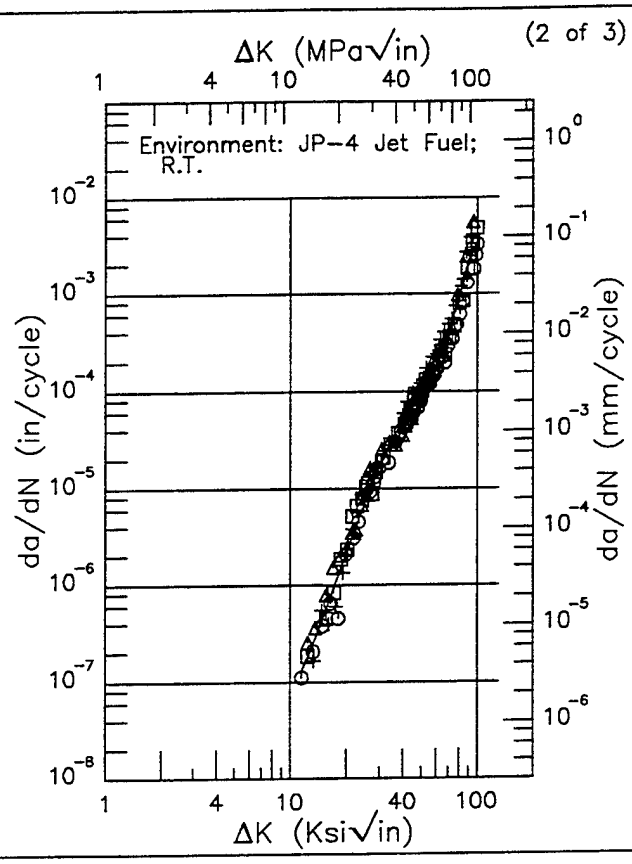
Ti–6Al–4V

E

Condition/Ht: BA
Form: 1.3 in. Forging
Specimen Type: WOL
Orientation: T–L
Stress Ratio: 0.02
Frequency: 0.1 – 20 Hz

Yield Strength: 110 – 110.5 ksi
Ult. Strength: 124.5 – 125 ksi
Specimen Thk: 1.25 in.
Specimen Width: 5 in.
Ref: MA005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.97 (min)	0.118
13.	0.217
16.	0.576
20.	1.93
25.	6.57
30.	16.4
35.	31.1
40.	48.6
50.	94.9
60.	183.
70.	384.
80.	868.
90.	2005.
100.	3911.
104.34 (max)	4776.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.53 (min)	0.131
13.	0.220
16.	0.621
20.	2.09
25.	6.93
30.	16.8
35.	31.5
40.	49.4
50.	97.8
60.	183.
70.	373.
80.	892.
90.	2136.
99.96 (max)	3491.

RMS % Error	Life Prediction Ratio Summary
22.36	0. .5 .8 1.25 2.

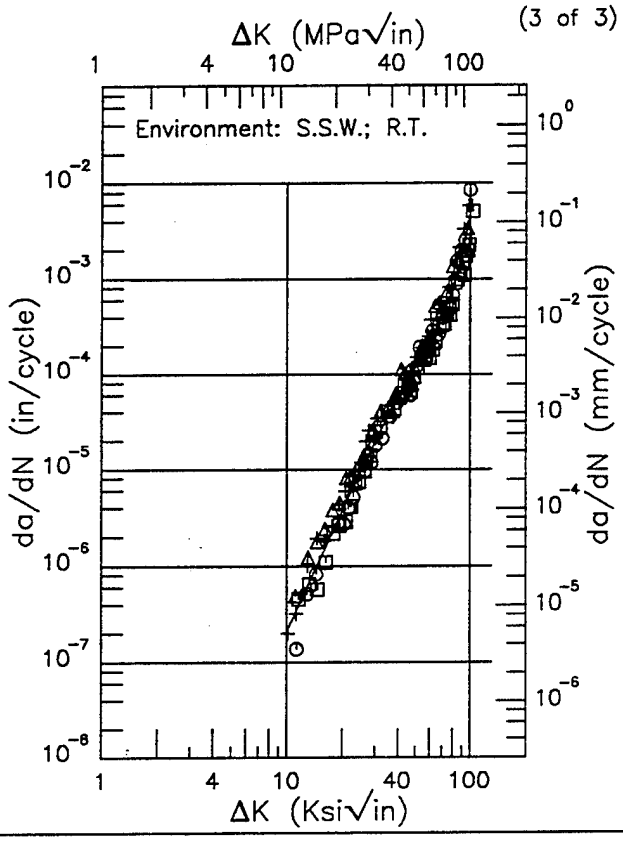
RMS % Error	Life Prediction Ratio Summary
27.07	0. .5 .8 1.25 2.

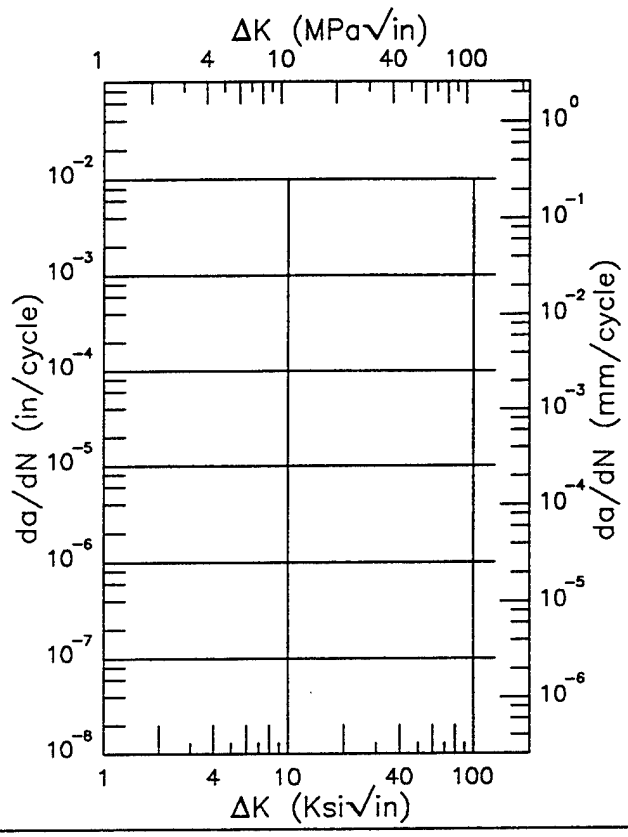
Figure 6.16.3.1.52

Ti–6Al–4V E

Condition/Ht: BA
Form: 1.3 in. Forging
Specimen Type: WOL
Orientation: T–L
Stress Ratio: 0.02
Frequency: 0.1 – 20 Hz

Yield Strength: 110 – 110.5 ksi
Ult. Strength: 124.5 – 125 ksi
Specimen Thk: 1.25 in.
Specimen Width: 5 in.
Ref: MA005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.11 (min)	0.217
13.	0.620
16.	1.48
20.	3.76
25.	9.37
30.	19.4
35.	35.0
40.	57.6
50.	126.
60.	229.
70.	399.
80.	781.
90.	1823.
100.	5139.
102.34 (max)	6727.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 33.82

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.16.3.1.52 (Concluded)

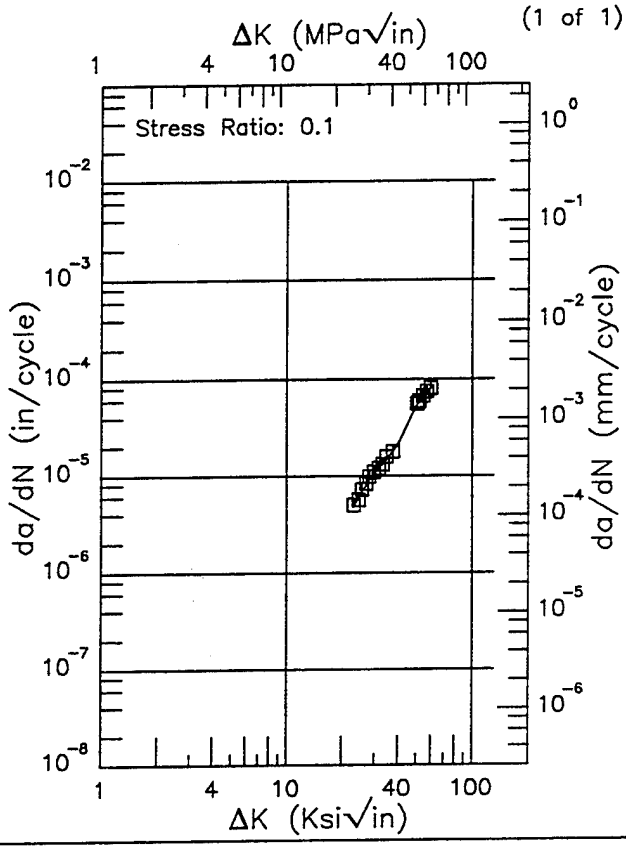
R

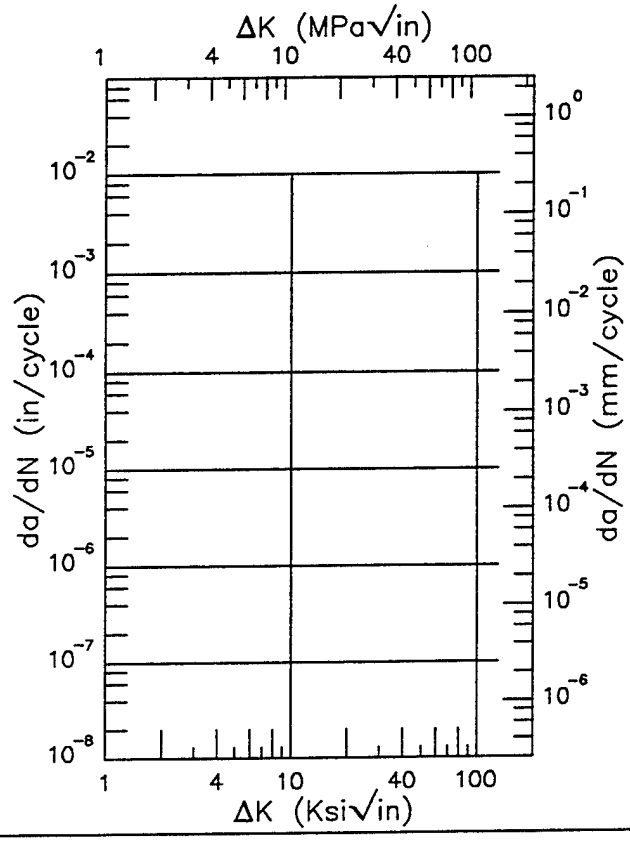
Ti–6Al–4V

Condition/Ht: BETA PROCESSED – MA
Form: 0.13 in. Sheet
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: DRY AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 91332

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
23.05 (min)	4.71
25.	6.46
30.	11.0
35.	15.2
40.	21.3
50.	52.5
59.48 (max)	79.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
4.21	0. .5 .8 1.25 2.

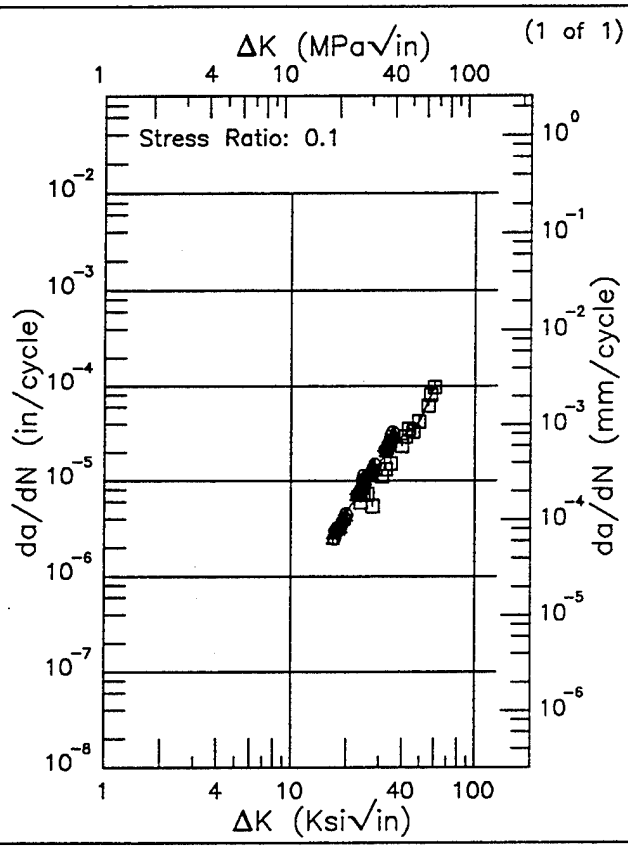
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

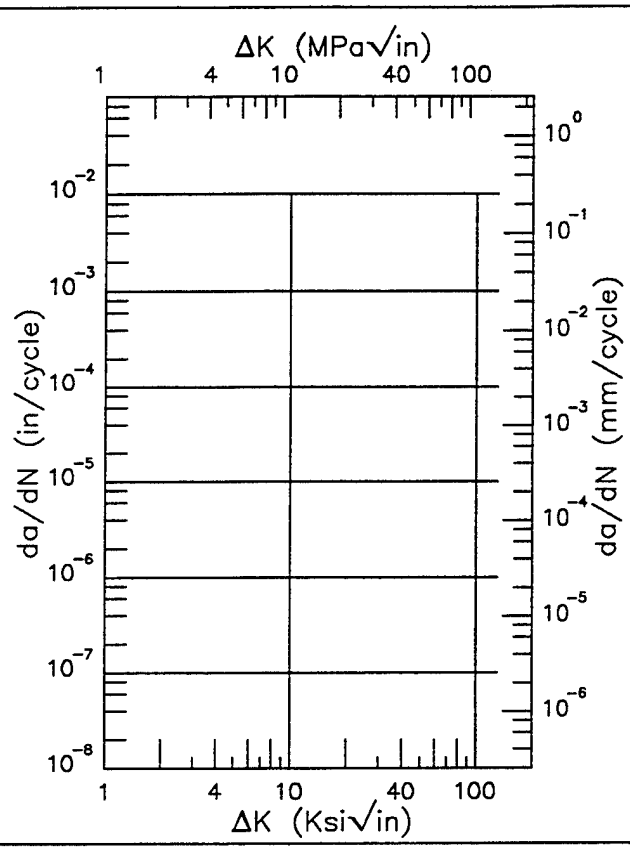
Figure 6.16.3.1.53

Ti–6Al–4V R

Condition/Ht: BETA PROCESSED – MA
Form: 0.3 – 0.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: DRY AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 91332





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.77 (min)	2.38
20.	4.72
25.	9.03
30.	15.2
35.	23.0
40.	28.9
50.	42.1
60.	95.8
60.18 (max)	97.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 15.26

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

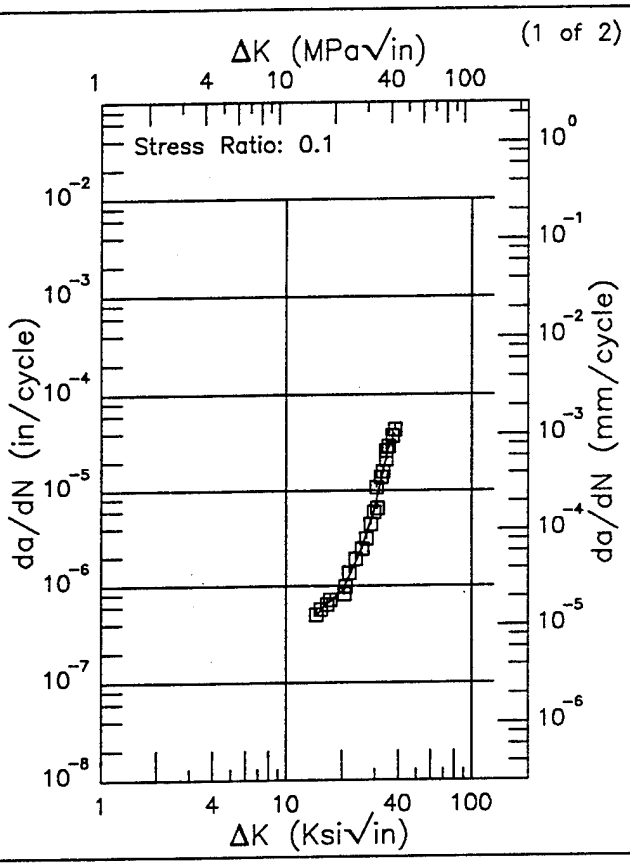
Figure 6.16.3.1.54

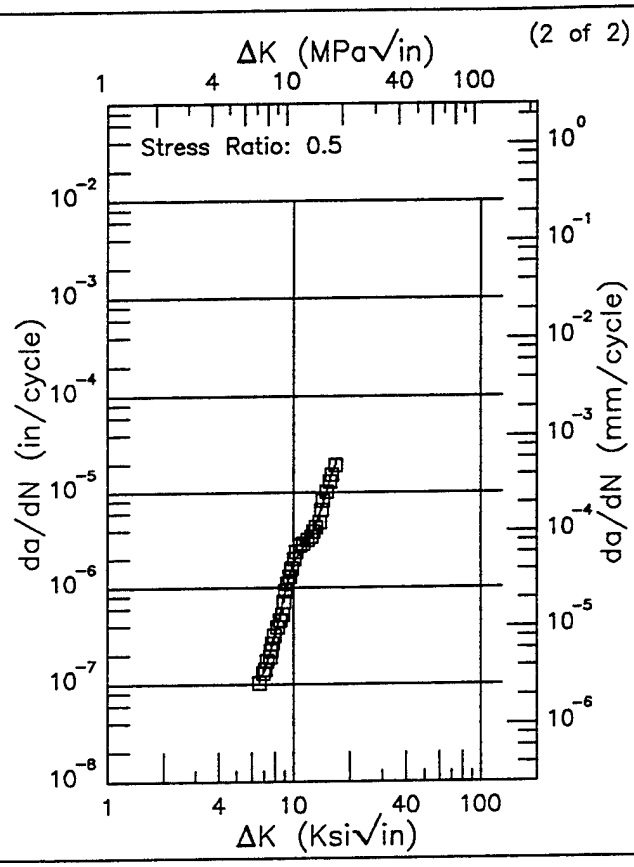
Ti–6Al–4V

R

Condition/Ht: BETA PROCESSED – MA
Form: 3 in. Plate
Specimen Type: WOL
Orientation: L–T
Frequency: 1 Hz
Environment: LAB AIR; RT

Yield Strength: 130.4 ksi
Ult. Strength: 138.1 ksi
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: UD008





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.50 (min)	0.493
16.	0.611
20.	0.874
25.	2.24
30.	6.50
35.	27.0
38.26 (max)	40.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.57 (min)	0.114
7.	0.132
8.	0.316
9.	0.874
10.	1.84
13.	4.17
16.	15.2
16.76 (max)	19.5

RMS % Error	Life Prediction Ratio Summary
12.51	0. .5 .8 1.25 2.

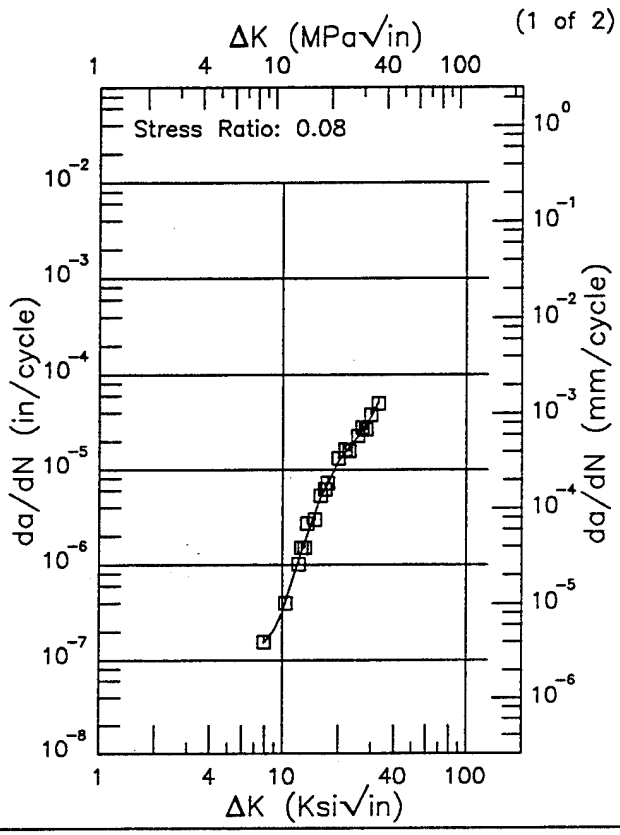
RMS % Error	Life Prediction Ratio Summary
8.73	0. .5 .8 1.25 2.

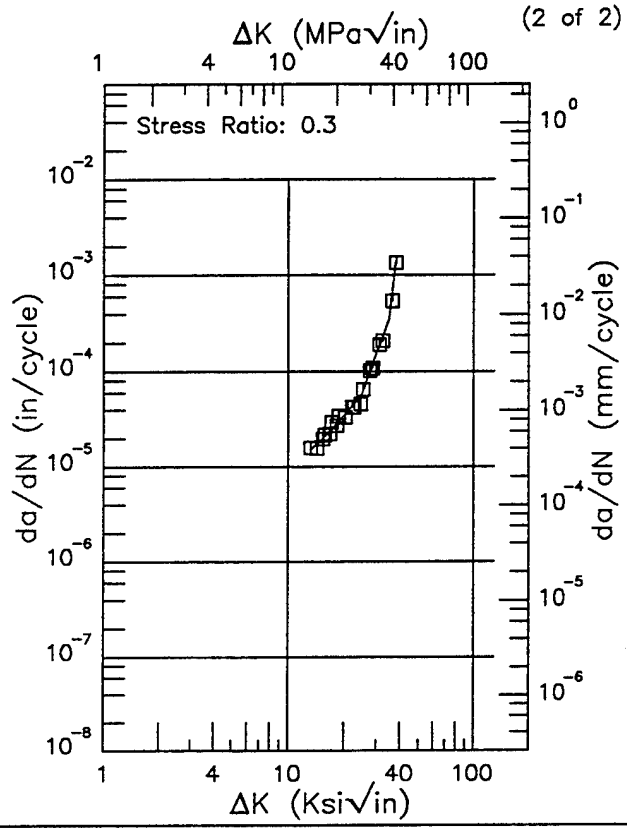
Figure 6.16.3.1.55

Ti–6Al–4V R

Condition/Ht: DB
Form: 0.63 – 1.5 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 115 – 153 ksi
Ult. Strength: 126 – 165 ksi
Specimen Thk: 1 in.
Specimen Width: 4.94 – 6 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.88 (min)	0.153
8.	0.156
9.	0.208
10.	0.331
13.	1.59
16.	5.14
20.	12.5
25.	21.5
30.	36.3
32.73 (max)	50.5

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.23 (min)	14.9
16.	21.1
20.	34.7
25.	57.3
30.	157.
35.	359.
37.82 (max)	1368.

RMS % Error 10.63

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 8.89

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

Figure 6.16.3.1.56

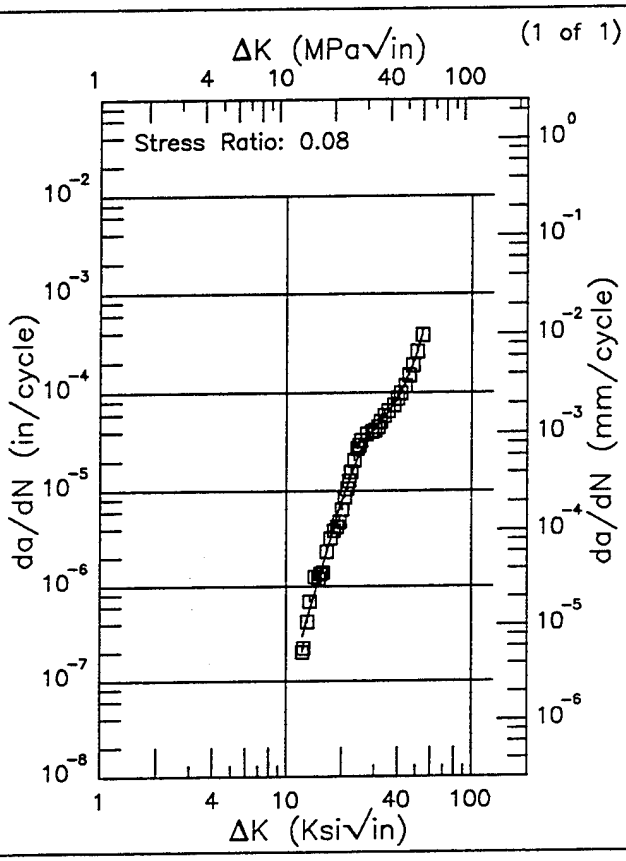
Ti–6Al–4V

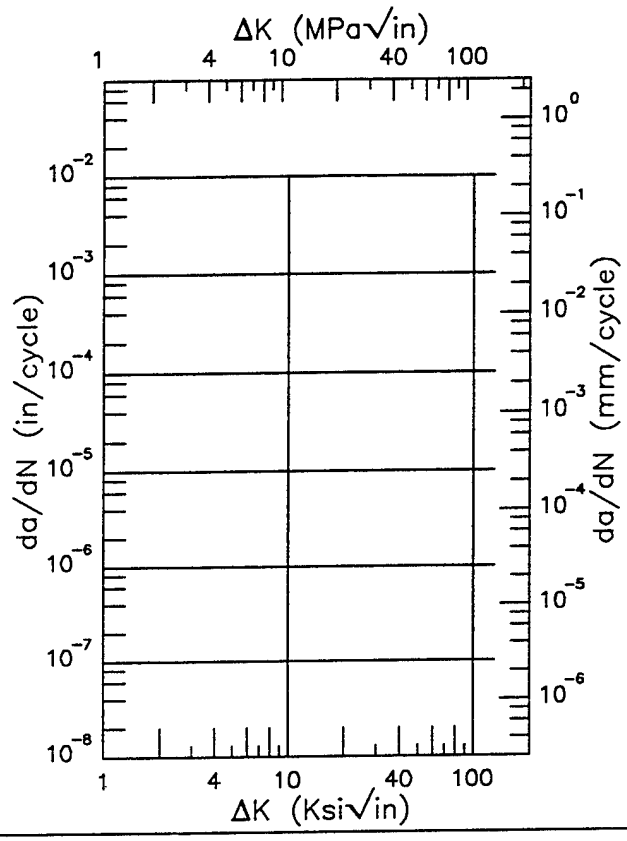
R

Condition/Ht: DB
Form: 8 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 118 ksi
Ult. Strength: 128 ksi
Specimen Thk: 0.992 in.
Specimen Width: 6 in.
Ref: 85837

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.21 (min)	0.296
13.	0.442
16.	1.81
20.	7.90
25.	25.4
30.	44.8
35.	62.2
40.	86.3
50.	226.
54.03 (max)	380.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 16.59

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

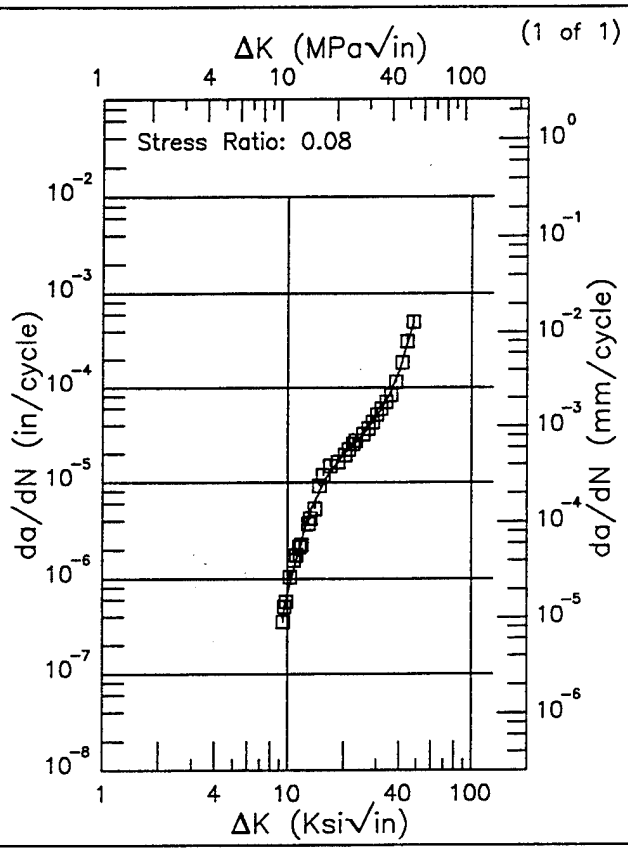
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

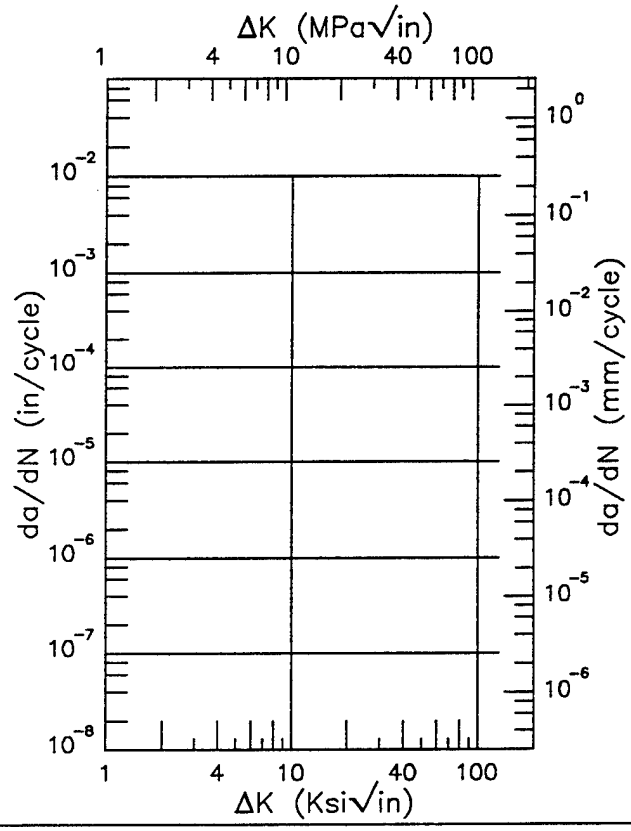
Figure 6.16.3.1.57

Ti–6Al–4V R

Condition/Ht: DB
Form: 8 in. Plate
Specimen Type: CT
Orientation: S–T
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 114 ksi
Ult. Strength: 128 ksi
Specimen Thk: 0.993 in.
Specimen Width: 4.94 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.39 (min)	0.390
10.	0.718
13.	4.61
16.	11.0
20.	19.9
25.	31.3
30.	48.3
35.	81.1
40.	151.
47.88 (max)	496.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 11.31

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

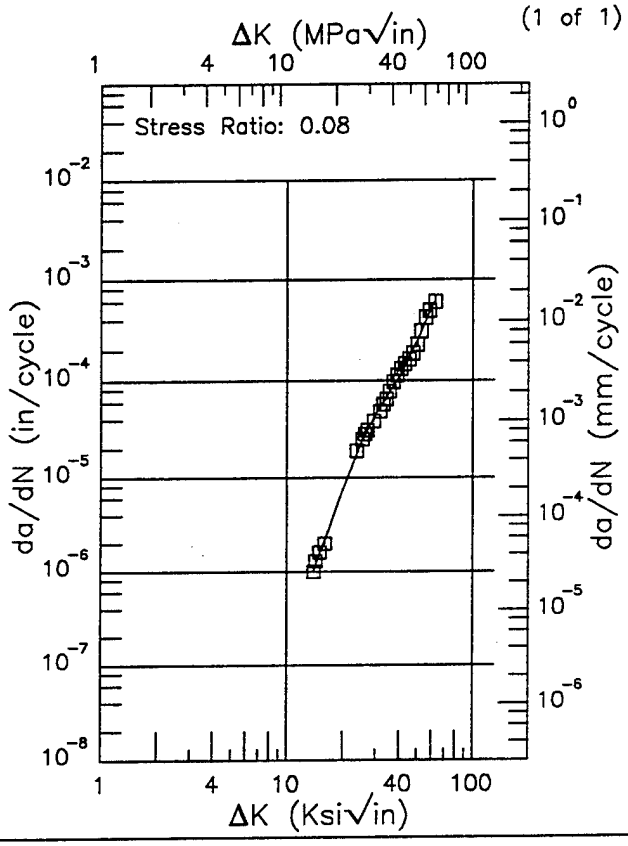
Figure 6.16.3.1.58

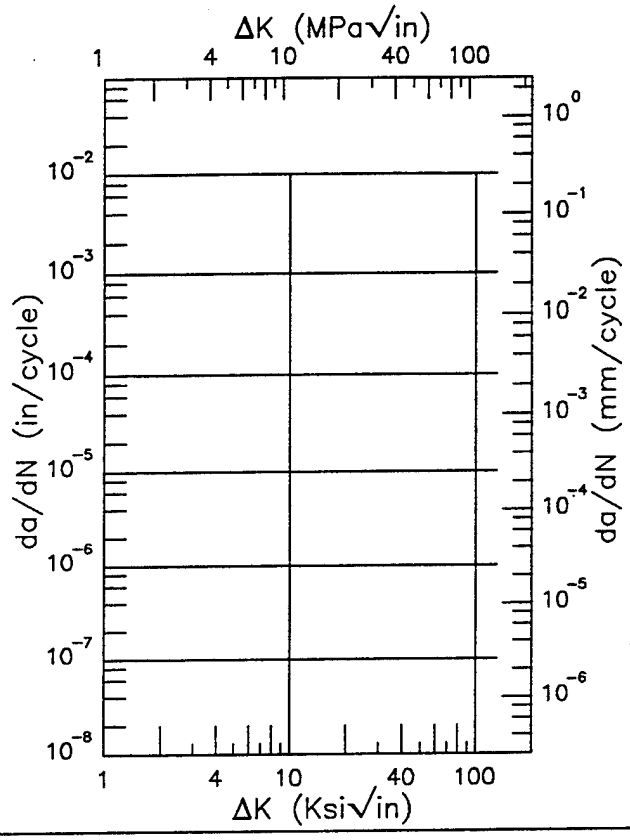
Ti–6Al–4V

R

Condition/Ht: DB + 2DBTC
Form: 8 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 114 ksi
Ult. Strength: 128 ksi
Specimen Thk: 0.996 in.
Specimen Width: 6 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.92 (min)	1.02
16.	2.18
20.	7.62
25.	23.1
30.	45.9
35.	73.5
40.	110.
50.	249.
60.	536.
62.46 (max)	601.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 6.60

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

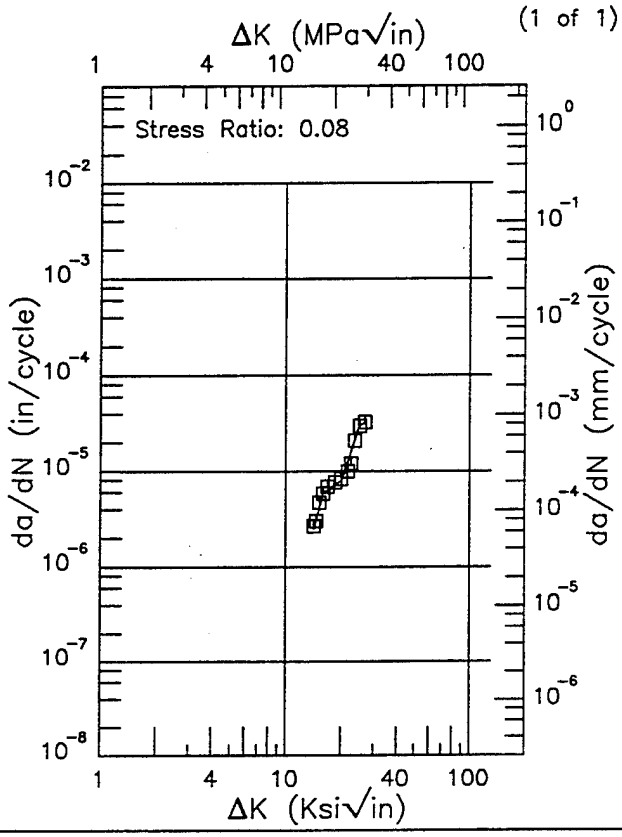
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

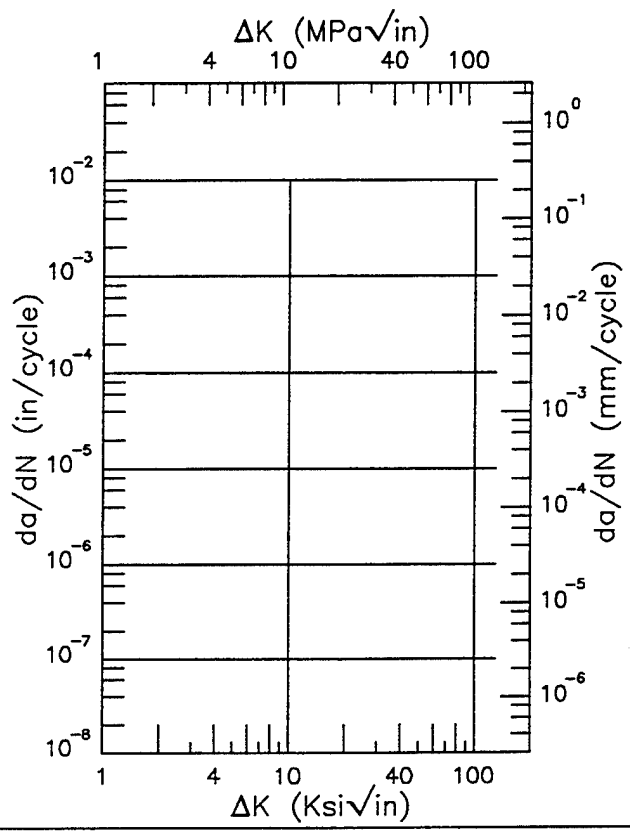
Figure 6.16.3.1.59

Ti–6Al–4V R

Condition/Ht: DB + 2DBTC
Form: 8 in. Plate
Specimen Type: CT
Orientation: S–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 114 ksi
Ult. Strength: 128 ksi
Specimen Thk: 0.983 in.
Specimen Width: 4.95 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.18 (min)	2.46
16.	5.88
20.	7.97
25.	29.9
26.83 (max)	32.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.46	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

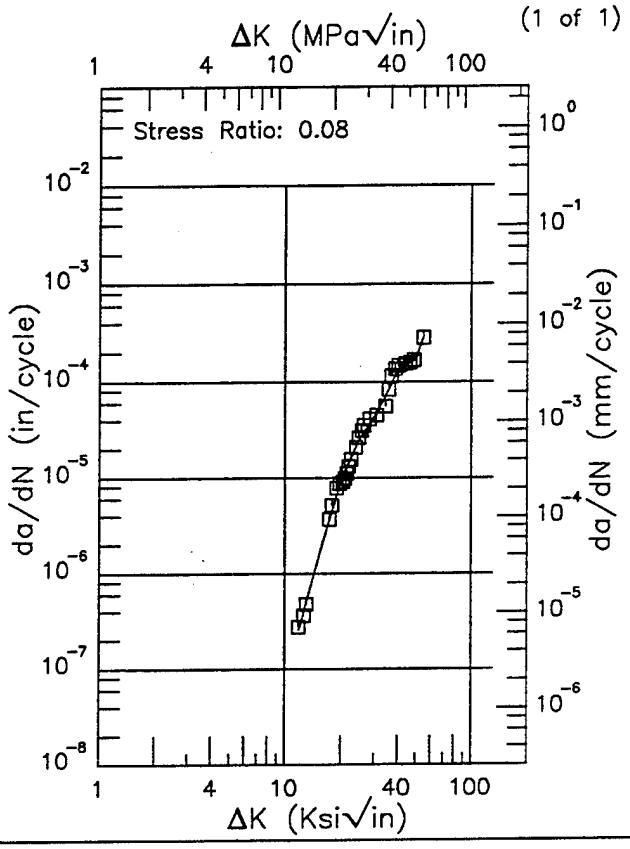
Figure 6.16.3.1.60

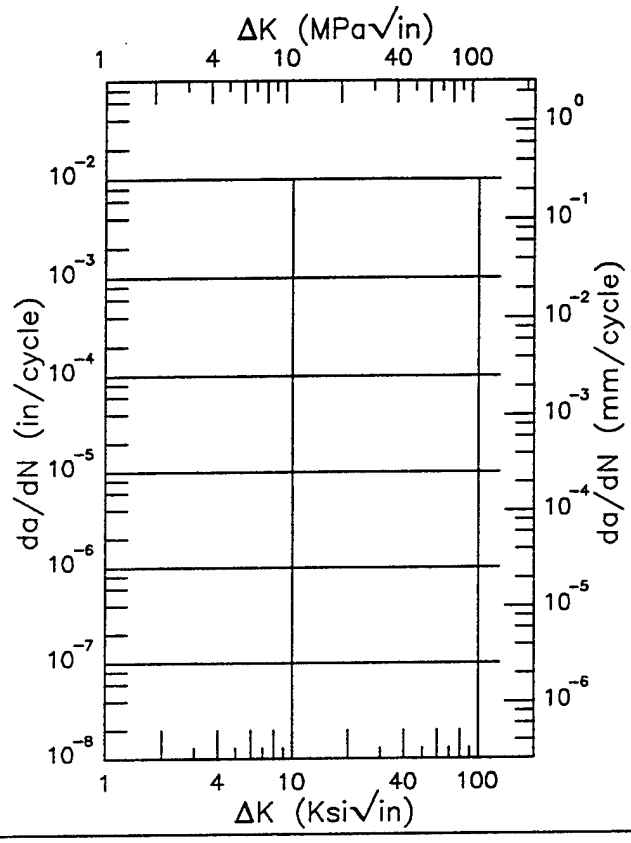
R

Ti–6Al–4V

Condition/Ht: DB + 4DBTC
Form: 8 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 115 ksi
Ult. Strength: 126 ksi
Specimen Thk: 0.99 in.
Specimen Width: 6 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.85 (min)	0.255
13.	0.475
16.	2.15
20.	9.51
25.	25.4
30.	42.9
35.	76.1
40.	132.
50.	171.
54.46 (max)	281.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 11.49

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

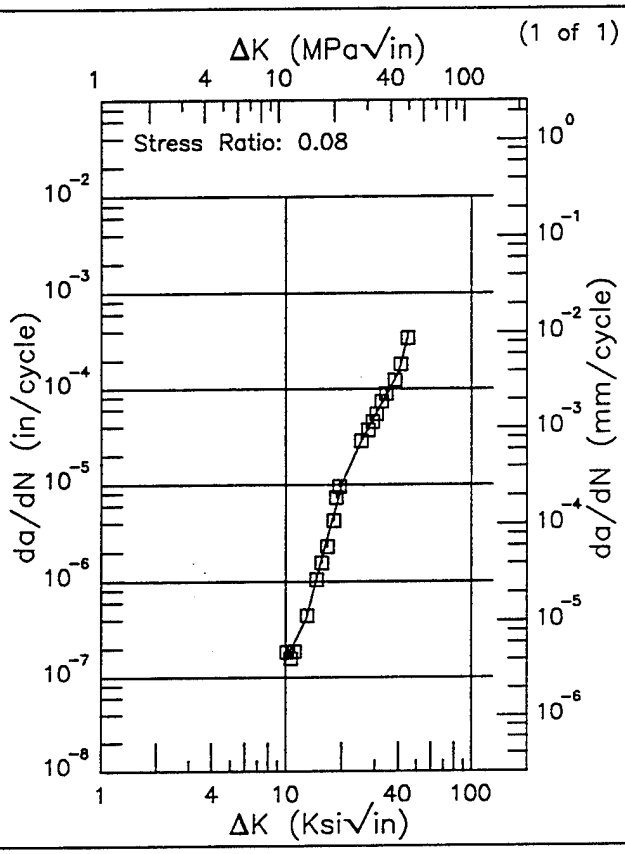
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

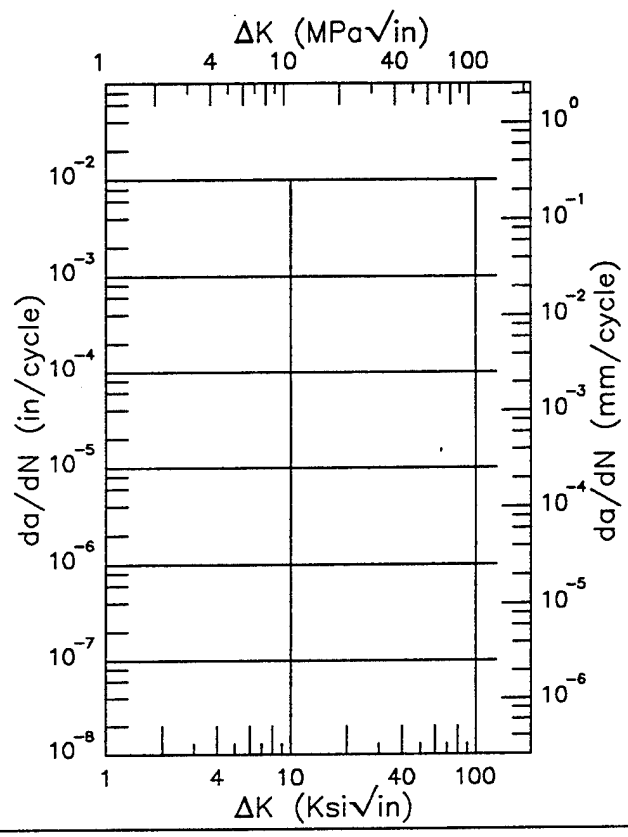
Figure 6.16.3.1.61

Ti–6Al–4V R

Condition/Ht: DB + TR
Form: 1.5 in. Plate
Specimen Type: CT
Orientation: S–T
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 111 ksi
Ult. Strength: 128 ksi
Specimen Thk: 1 in.
Specimen Width: 5 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.12 (min)	0.166
13.	0.420
16.	2.06
20.	9.96
25.	26.8
30.	51.5
35.	89.6
40.	150.
44.78 (max)	339.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 11.17

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

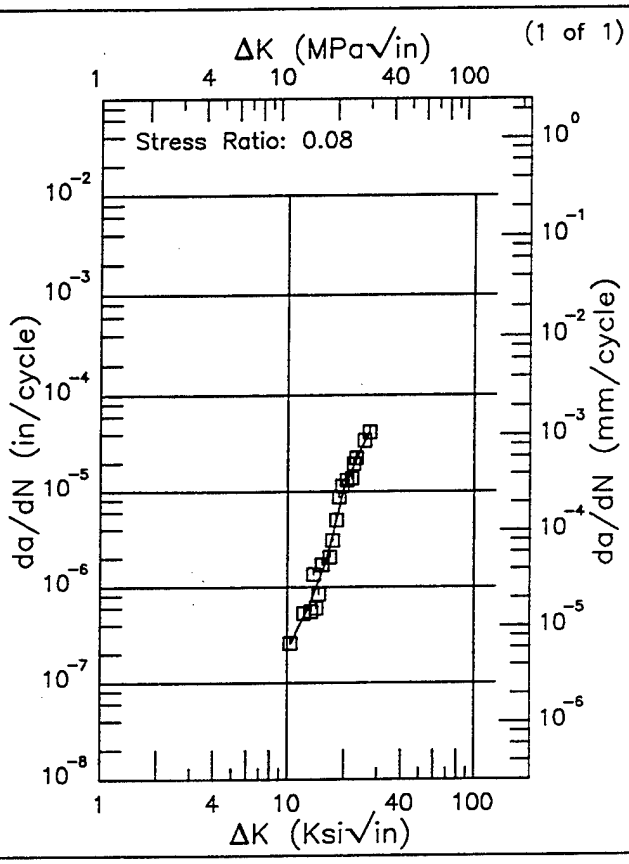
Figure 6.16.3.1.62

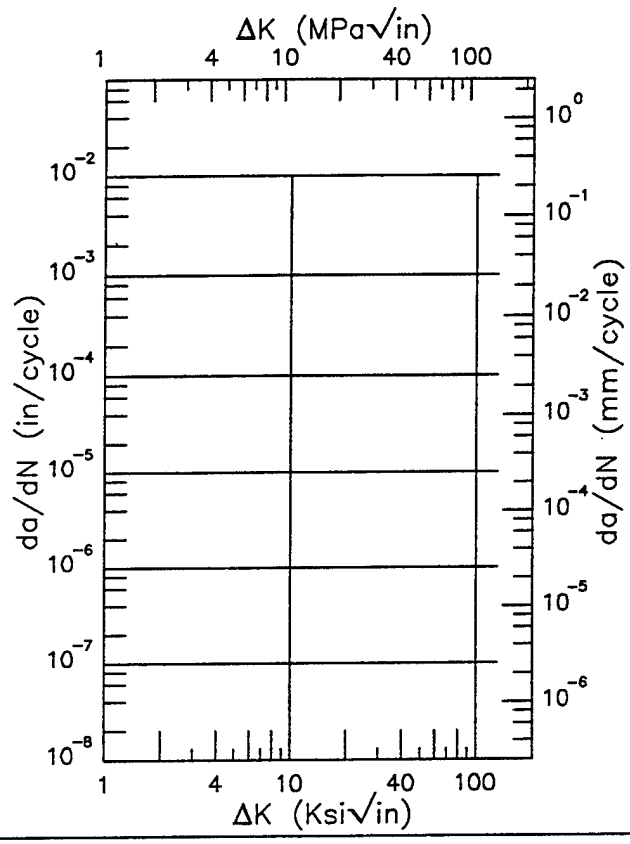
R

Ti–6Al–4V

Condition/Ht: DBT + PC
Form: 2.5 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 122 ksi
Ult. Strength: 135 ksi
Specimen Thk: 0.35 in.
Specimen Width: 7.4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.37 (min)	0.256
13.	0.623
16.	1.87
20.	11.1
25.	30.7
27.18 (max)	41.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
23.75	0. .5 .8 1.25 2.

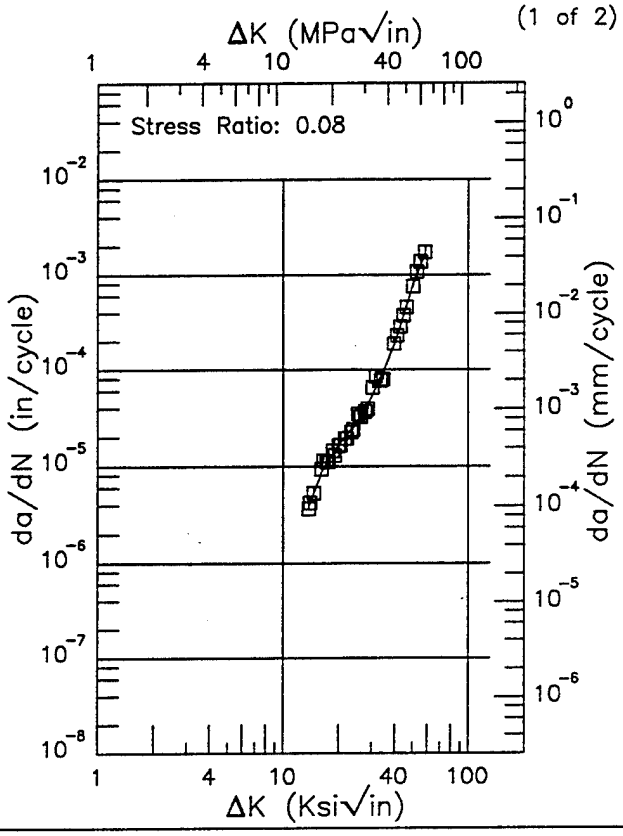
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

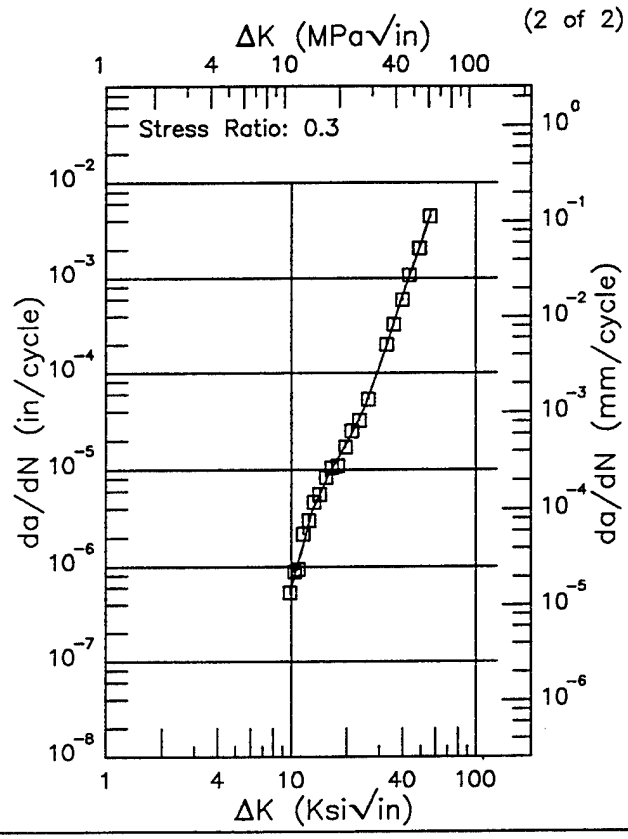
Figure 6.16.3.1.63

Ti–6Al–4V R

Condition/Ht: DBTC
Form: 0.62 – 0.63 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: DRY AIR; RT

Yield Strength: 138 – 140 ksi
Ult. Strength: 148 – 150 ksi
Specimen Thk: 0.496 – 0.5 in.
Specimen Width: 6 in.
Ref: 88579;85837



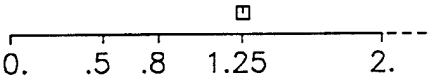


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.74 (min)	3.92
16.	8.55
20.	16.7
25.	28.3
30.	51.6
35.	98.9
40.	191.
50.	757.
58.30 (max)	1723.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.83 (min)	0.513
10.	0.602
13.	3.74
16.	9.00
20.	18.7
25.	43.7
30.	115.
35.	295.
40.	663.
50.	2273.
56.14 (max)	4415.

RMS % Error 10.40

Life Prediction Ratio Summary



RMS % Error 10.25

Life Prediction Ratio Summary

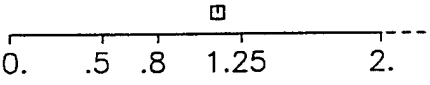


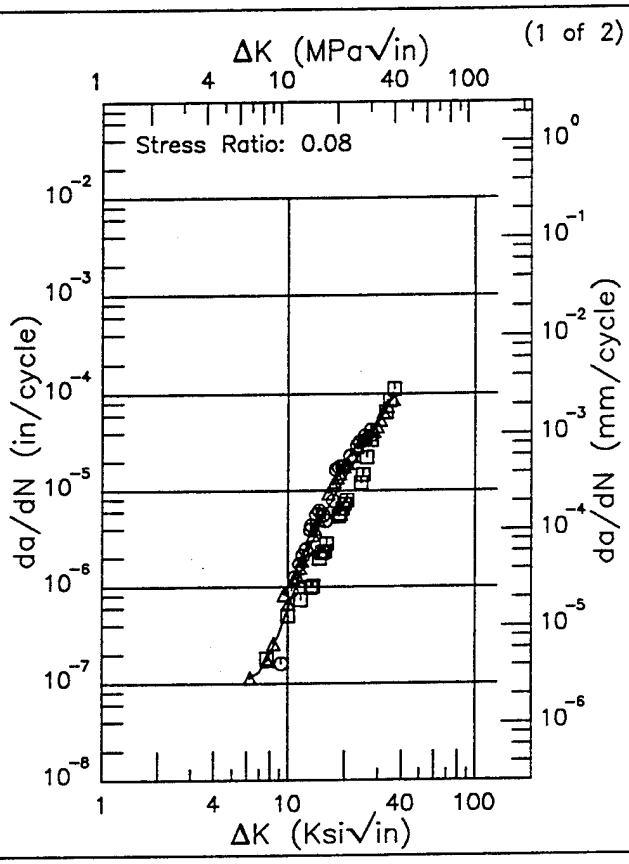
Figure 6.16.3.1.64

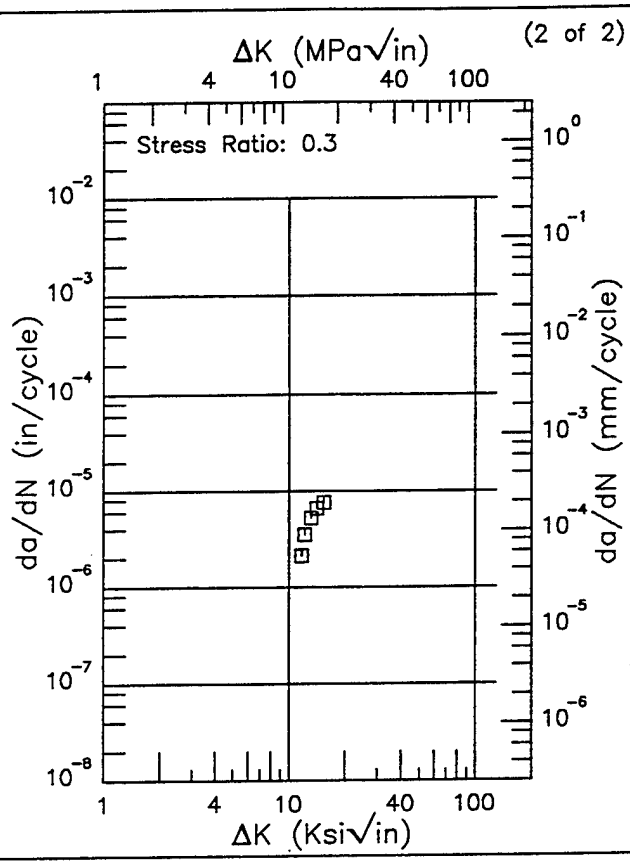
Ti–6Al–4V

R

Condition/Ht: DBTC
Form: 1.25 – 1.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 117 – 125 ksi
Ult. Strength: 129 – 138 ksi
Specimen Thk: 0.99 – 1 in.
Specimen Width: 6 – 7.4 in.
Ref: 88579;85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.24 (min)	0.112
7.	0.131
8.	0.201
9.	0.341
10.	0.592
13.	2.49
16.	6.28
20.	13.5
25.	27.4
30.	49.2
35.	83.9
36.57 (max)	99.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
37.08	0. .5 .8 1.25 2.

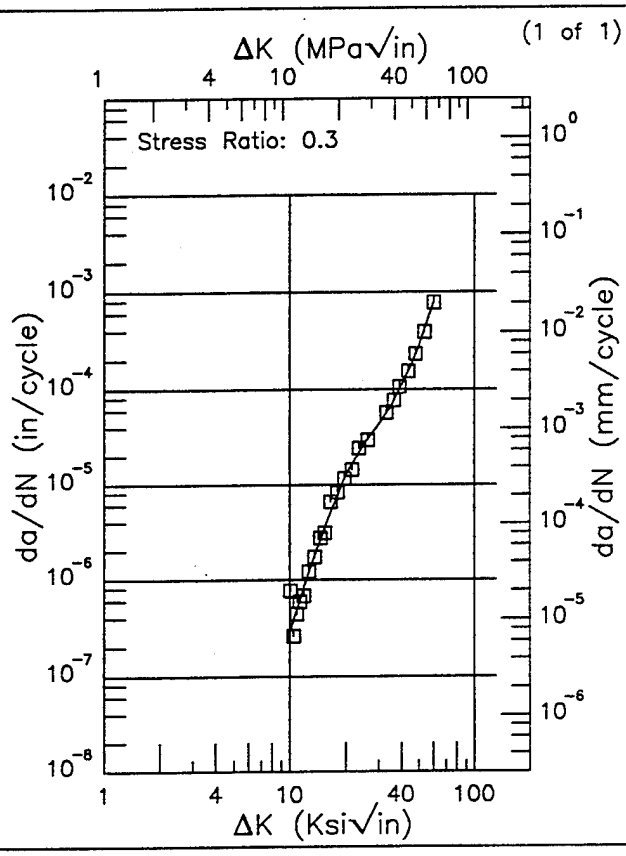
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

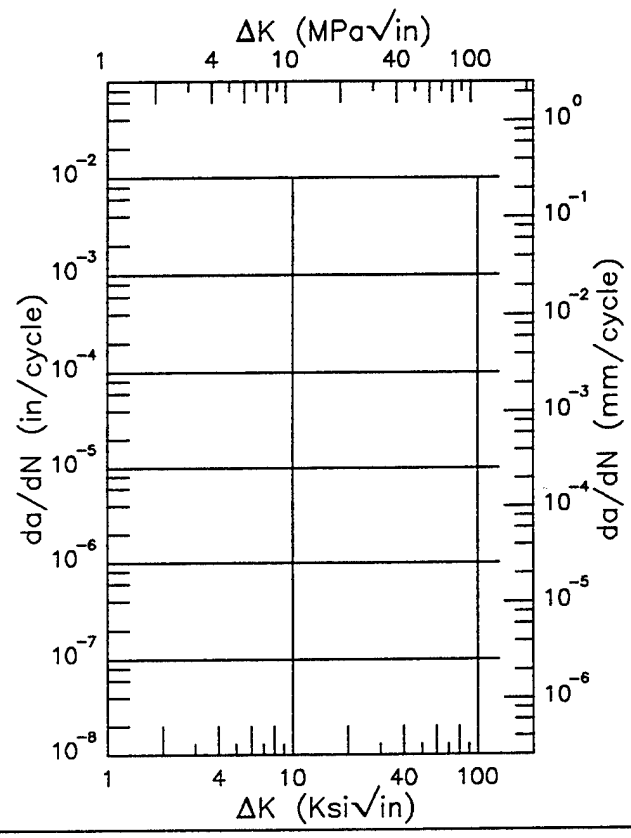
Figure 6.16.3.1.65

Ti–6Al–4V R

Condition/Ht: DBTC
Form: 1.25 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: DRY AIR; RT

Yield Strength: 125 ksi
Ult. Strength: 137 ksi
Specimen Thk: 1 in.
Specimen Width: 6 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.00 (min)	0.296
13.	1.39
16.	4.45
20.	12.8
25.	27.3
30.	43.3
35.	67.5
40.	111.
50.	281.
59.95 (max)	782.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 35.47

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

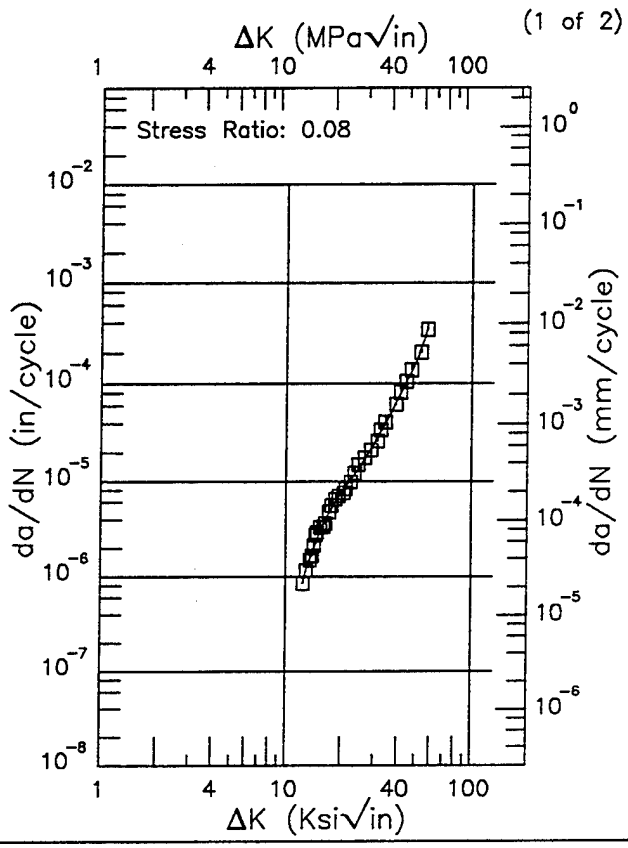
Figure 6.16.3.1.66

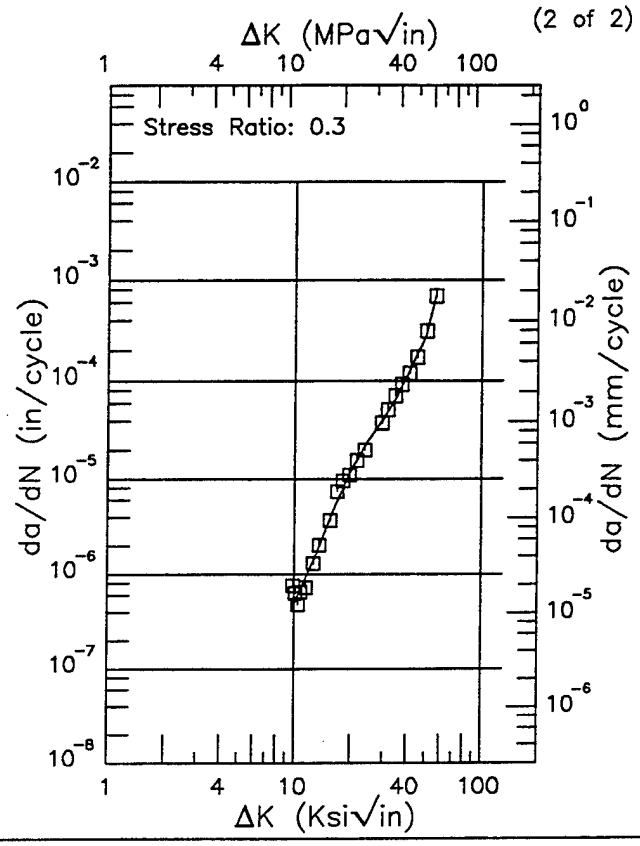
R

Ti–6Al–4V

Condition/Ht: DBTC
Form: 1.25 – 1.5 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: DRY AIR; RT

Yield Strength: 119 – 128 ksi
Ult. Strength: 134 – 139 ksi
Specimen Thk: 0.96 – 1 in.
Specimen Width: 6 – 7.46 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.36 (min)	0.842
13.	1.22
16.	3.71
20.	7.71
25.	14.1
30.	25.2
35.	43.4
40.	71.4
50.	162.
57.13 (max)	334.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.82 (min)	0.458
10.	0.489
13.	1.56
16.	4.42
20.	12.3
25.	25.7
30.	41.8
35.	68.0
40.	113.
50.	276.
56.48 (max)	694.

RMS % Error	Life Prediction Ratio Summary
8.42	0. .5 .8 1.25 2.

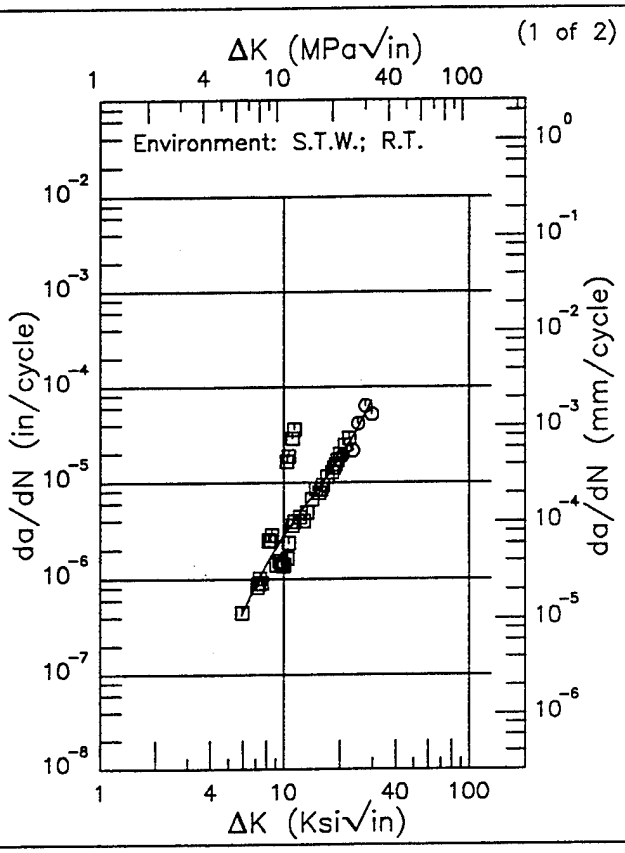
RMS % Error	Life Prediction Ratio Summary
18.51	0. .5 .8 1.25 2..

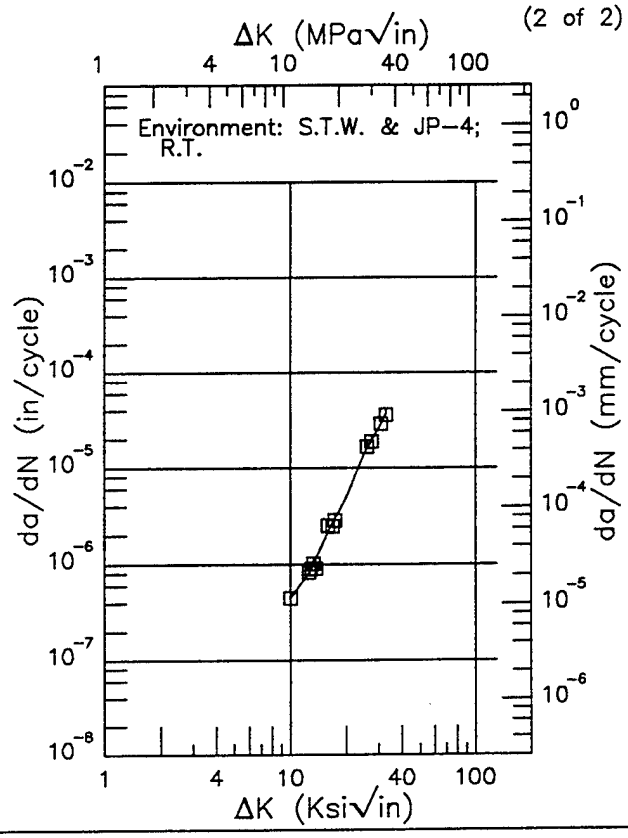
Figure 6.16.3.1.67

Ti–6Al–4V E

Condition/Ht: DBTC
Form: 1.5 – 2.5 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08
Frequency: 1 Hz

Yield Strength: 119 – 125 ksi
Ult. Strength: 132 – 135 ksi
Specimen Thk: 0.962 – 1 in.
Specimen Width: 4.94 – 7.4 in.
Ref: 85837;88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.90 (min)	0.421
6.	0.455
7.	0.866
8.	1.41
9.	2.06
10.	2.81
13.	5.66
16.	9.65
20.	17.9
25.	36.8
29.65 (max)	71.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.95 (min)	0.449
10.	0.449
13.	0.891
16.	2.19
20.	4.92
25.	13.9
30.	25.9
32.61 (max)	35.8

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
7.49	0. .5 .8 1.25 2.

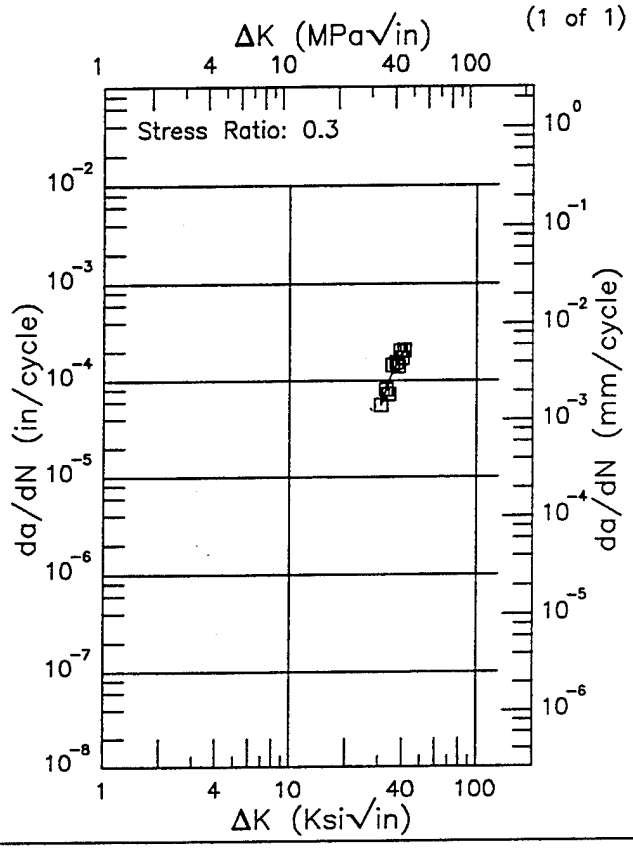
Figure 6.16.3.1.68

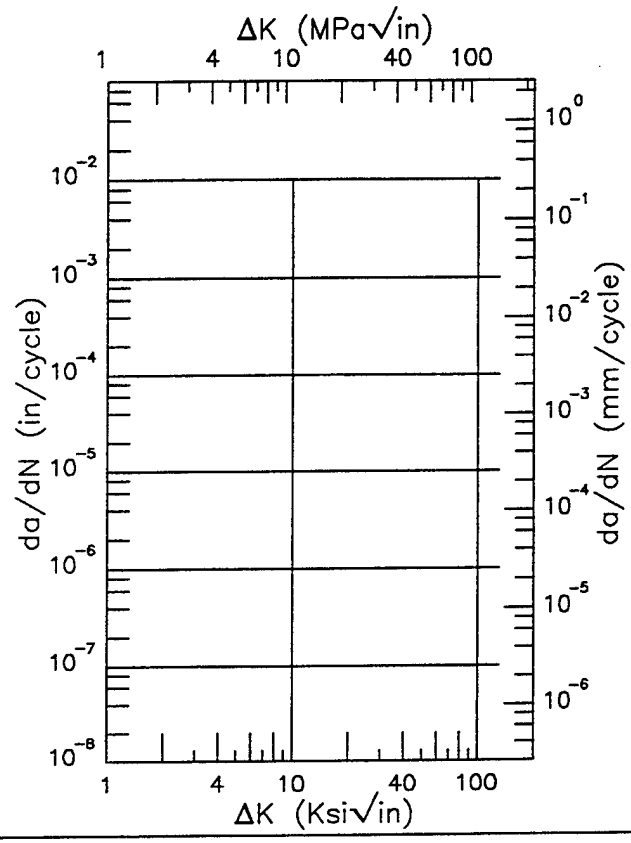
R

Ti–6Al–4V

Condition/Ht: DBTC(RA)
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: DRY AIR; RT

Yield Strength: 134 ksi
Ult. Strength: 145 ksi
Specimen Thk: 0.5 in.
Specimen Width: 6 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
30.88 (min)	55.5
35.	116.
40.	196.
40.98 (max)	194.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
13.38	0. .5 .8 1.25 2.

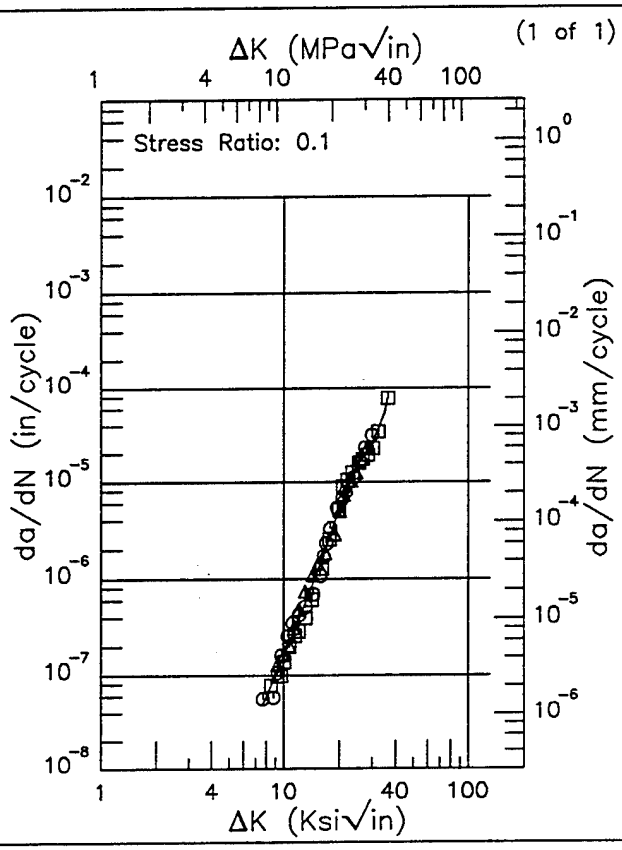
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

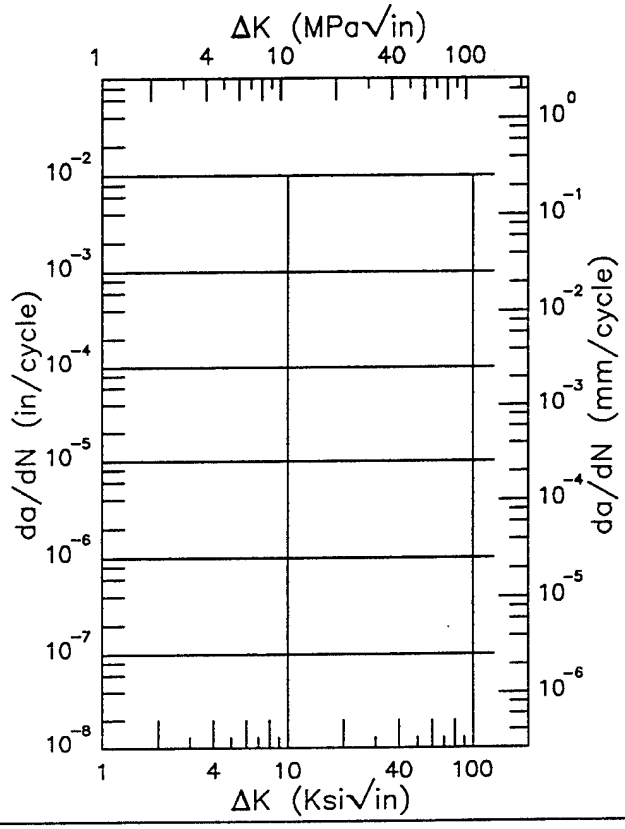
Figure 6.16.3.1.69

Ti–6Al–4V R

Condition/Ht: HIP 1650F 15 KSI
Form: Casting
Specimen Type: CT
Orientation:
Frequency: 0.1 – 20 Hz
Environment: LAB AIR; RT

Yield Strength: 60 ksi
Ult. Strength:
Specimen Thk: 0.1 in.
Specimen Width: 0.999 – 1 in.
Ref: WL011





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.64 (min)	0.0490
8.	0.0597
9.	0.0993
10.	0.158
13.	0.529
16.	1.51
20.	5.23
25.	15.3
30.	25.5
35.	55.0
36.32 (max)	78.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
17.83	□ ○ △ 0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

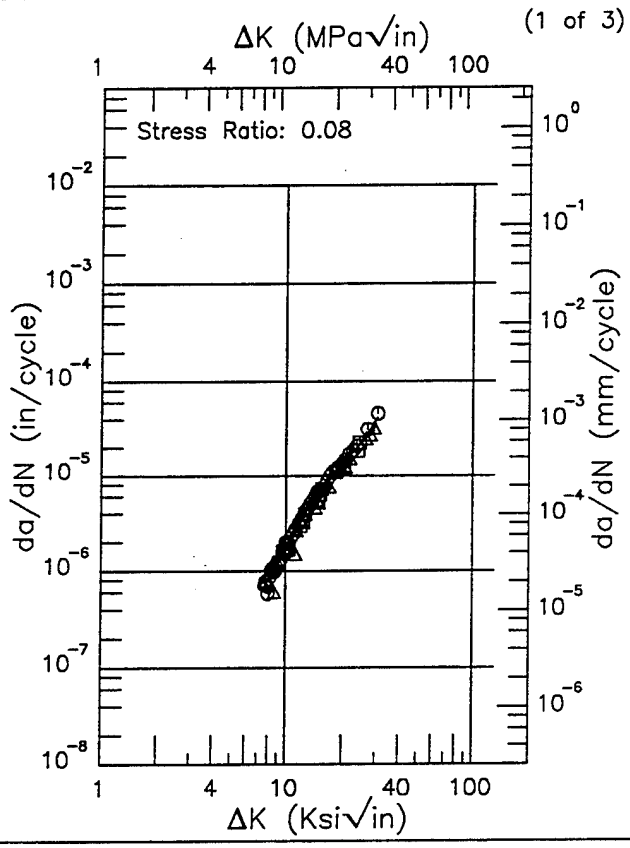
Figure 6.16.3.1.70

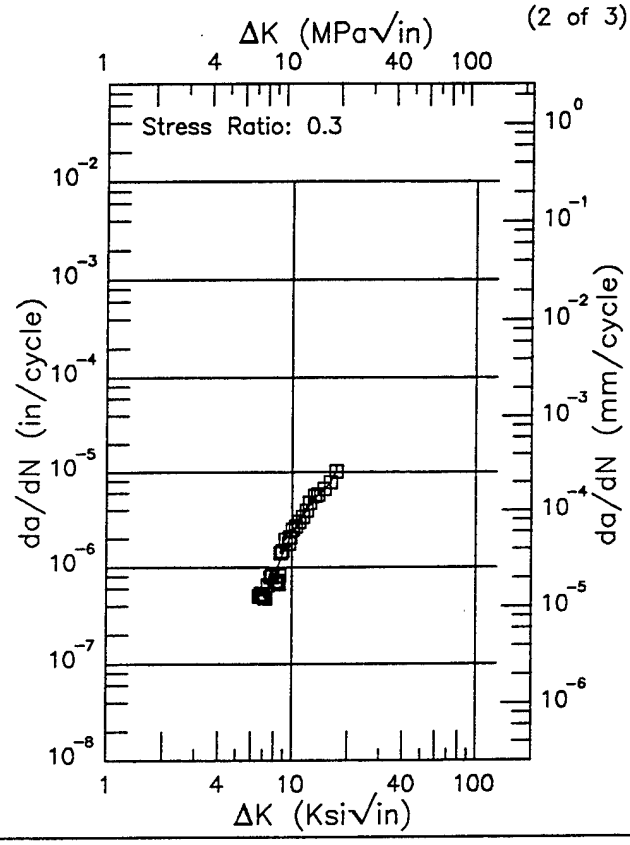
R

Ti–6Al–4V

Condition/Ht: MA
Form: 0.1 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 6 Hz
Environment: DRY AIR; RT

Yield Strength: 137 ksi
Ult. Strength: 147 ksi
Specimen Thk: 0.092 – 0.101 in.
Specimen Width: 23.98 – 24.22 in.
Ref: 86575





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.65 (min)	0.691
8.	0.785
9.	1.15
10.	1.67
13.	4.27
16.	7.80
20.	13.5
25.	22.3
30.	37.8
30.60 (max)	41.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.62 (min)	0.523
7.	0.511
8.	0.777
9.	1.43
10.	2.27
13.	5.06
16.	7.46
17.28 (max)	10.1

RMS % Error	Life Prediction Ratio Summary
11.20	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
13.10	0. .5 .8 1.25 2.

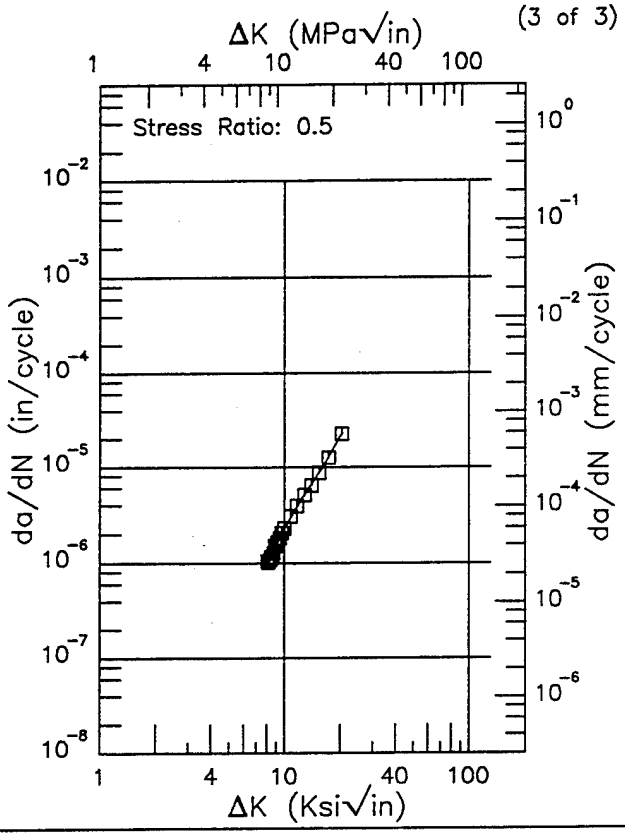
Figure 6.16.3.1.71

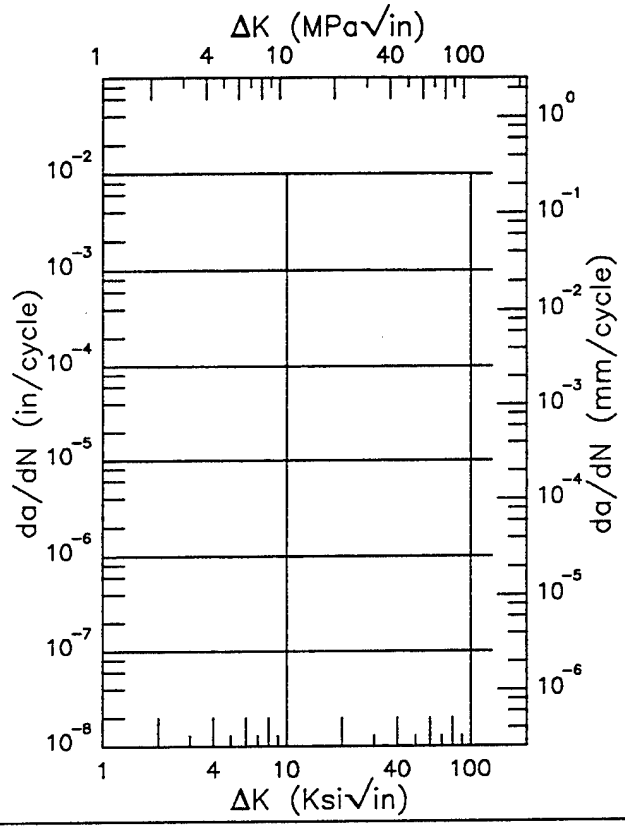
Ti–6Al–4V R

Condition/Ht: MA
Form: 0.1 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 6 Hz
Environment: DRY AIR; RT

Yield Strength: 137 ksi
Ult. Strength: 147 ksi
Specimen Thk: 0.092 – 0.101 in.
Specimen Width: 23.98 – 24.22 in.
Ref: 86575

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.06 (min)	0.930
9.	1.53
10.	2.30
13.	5.34
16.	9.87
20.	21.1
20.31 (max)	22.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
3.74	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

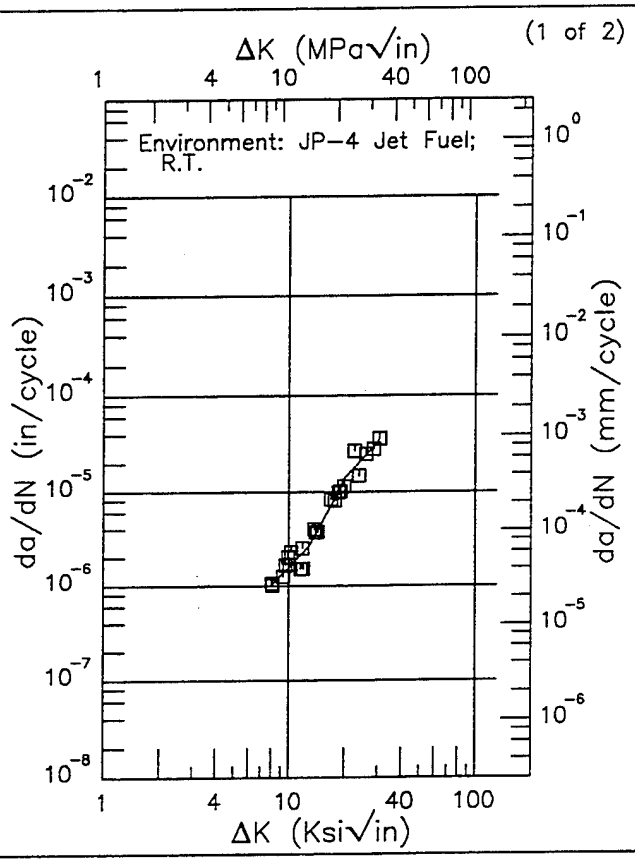
Figure 6.16.3.1.71 (Concluded)

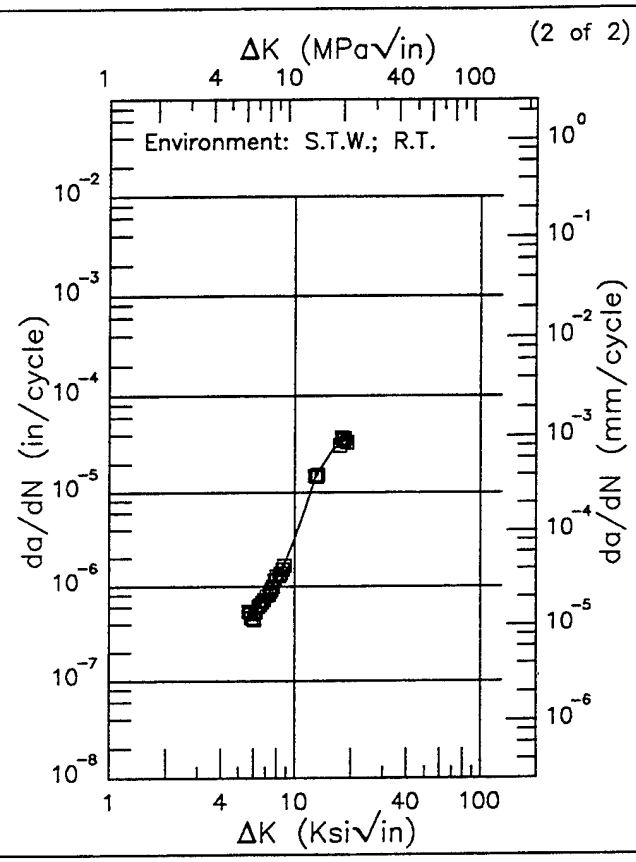
Ti–6Al–4V

E

Condition/Ht: MA
Form: 0.1 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.08
Frequency: 1 – 6 Hz

Yield Strength: 137 ksi
Ult. Strength: 147 ksi
Specimen Thk: 0.096 in.
Specimen Width: 24 in.
Ref: 86575





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.05 (min)	1.02
9.	1.30
10.	1.56
13.	2.68
16.	5.80
20.	13.9
25.	22.7
30.	33.0
30.58 (max)	35.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.67 (min)	0.447
6.	0.504
7.	0.747
8.	1.16
9.	1.90
10.	3.24
13.	15.0
16.	28.2
19.01 (max)	37.2

RMS % Error	Life Prediction Ratio Summary
19.82	0. .5 .8 1.25 2.

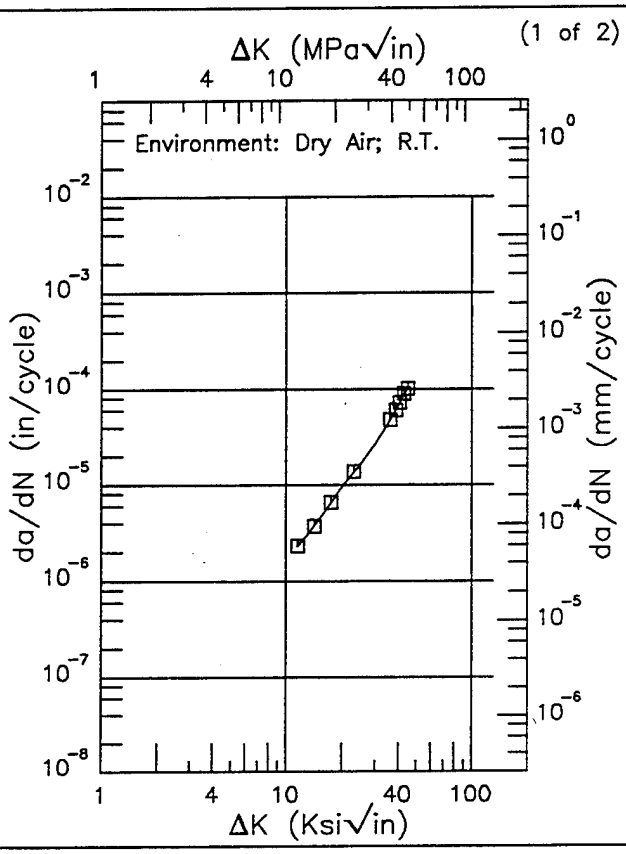
RMS % Error	Life Prediction Ratio Summary
6.84	0. .5 .8 1.25 2.

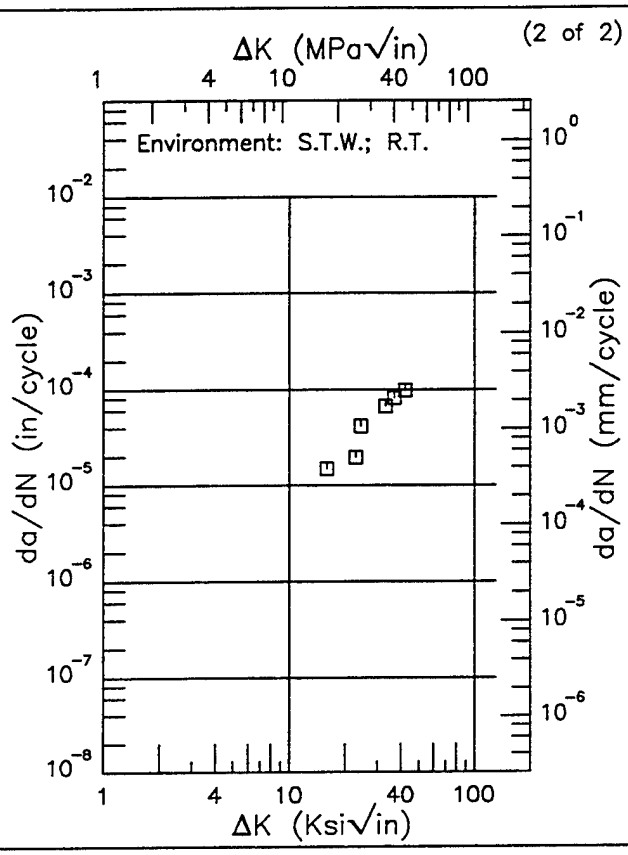
Figure 6.16.3.1.72

Ti–6Al–4V E

Condition/Ht: MA
Form: 0.1 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.08
Frequency: 6 Hz

Yield Strength: 143 ksi
Ult. Strength: 151 ksi
Specimen Thk: 0.096 – 0.097 in.
Specimen Width: 24 in.
Ref: 86575





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.52 (min)	2.30
13.	2.97
16.	5.14
20.	9.53
25.	16.5
30.	26.7
35.	43.2
40.	68.3
44.86 (max)	101.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 0.89

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

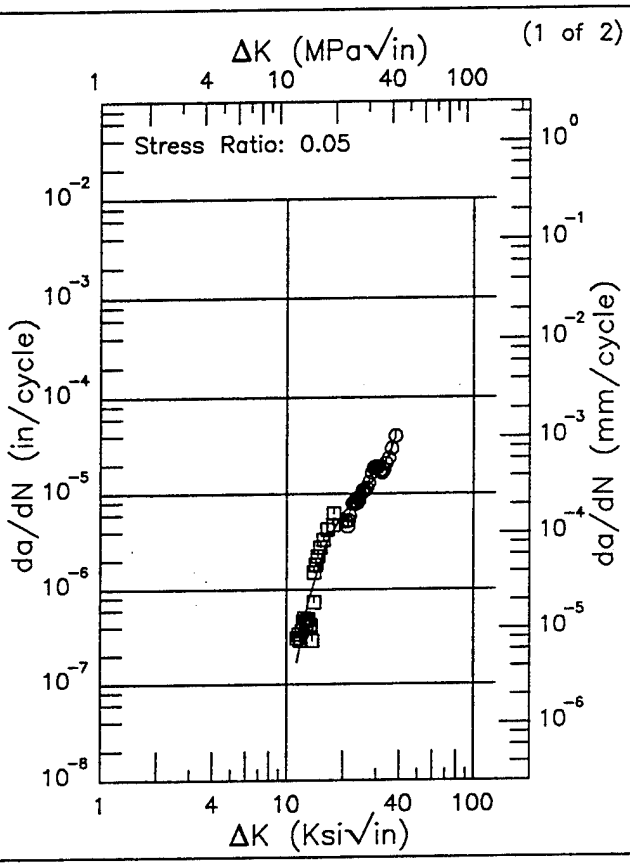
Figure 6.16.3.1.73

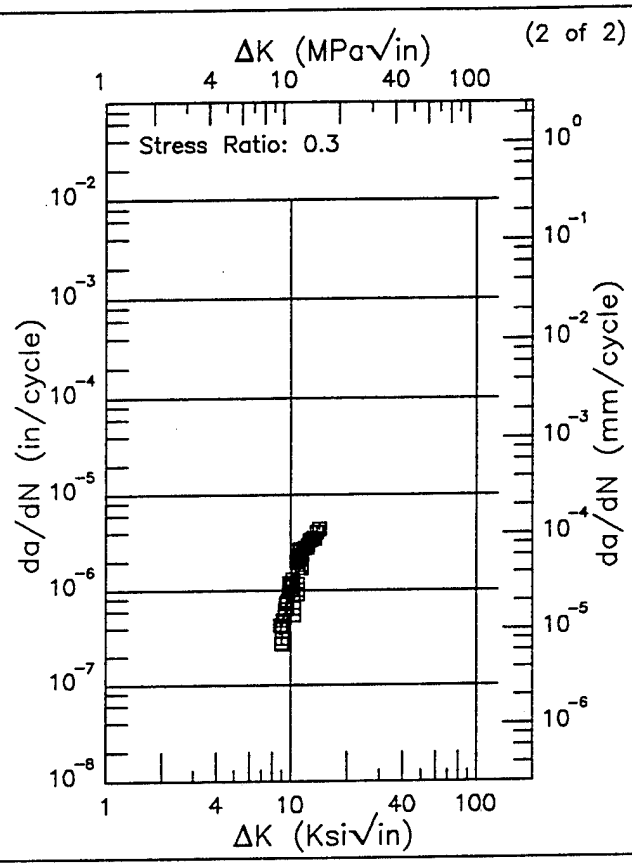
Ti–6Al–4V

R

Condition/Ht: MA
Form: 0.75 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 20 Hz
Environment: LAB AIR; RT

Yield Strength: 135.3 ksi
Ult. Strength: 137.6 ksi
Specimen Thk: 0.25 in.
Specimen Width: 2.5 in.
Ref: 88468





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.31 (min)	0.171
13.	0.716
16.	2.86
20.	6.34
25.	10.0
30.	14.9
35.	25.1
38.24 (max)	38.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.78 (min)	0.342
9.	0.429
10.	0.995
13.	3.46
14.23 (max)	4.08

RMS % Error	Life Prediction Ratio Summary
29.60	0. .5 .8 1.25 2.

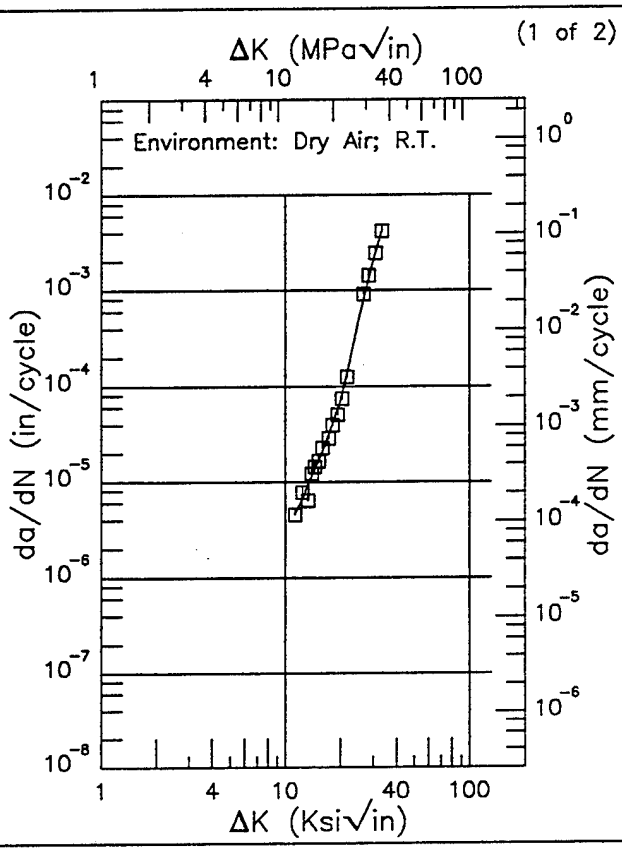
RMS % Error	Life Prediction Ratio Summary
26.53	0. .5 .8 1.25 2.

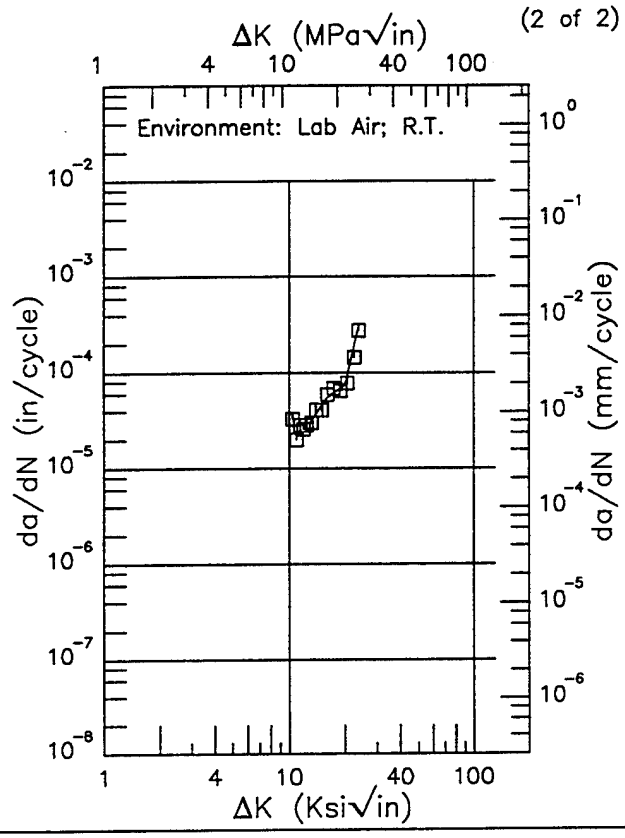
Figure 6.16.3.1.74

Ti–6Al–4V E

Condition/Ht: MA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.3
Frequency: 1 Hz

Yield Strength: 138 ksi
Ult. Strength: 148 ksi
Specimen Thk: 0.49 – 0.5 in.
Specimen Width: 6 in.
Ref: 88579



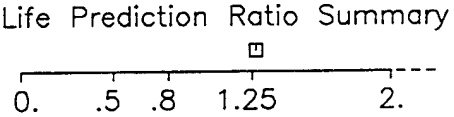


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.30 (min)	4.75
13.	8.13
16.	21.1
20.	69.4
25.	504.
30.	1996.
33.26 (max)	4131.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.36 (min)	28.0
13.	30.9
16.	55.0
20.	75.3
23.71 (max)	290.

RMS % Error 10.90

Life Prediction Ratio Summary



RMS % Error 14.05

Life Prediction Ratio Summary

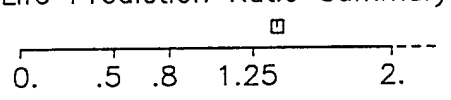


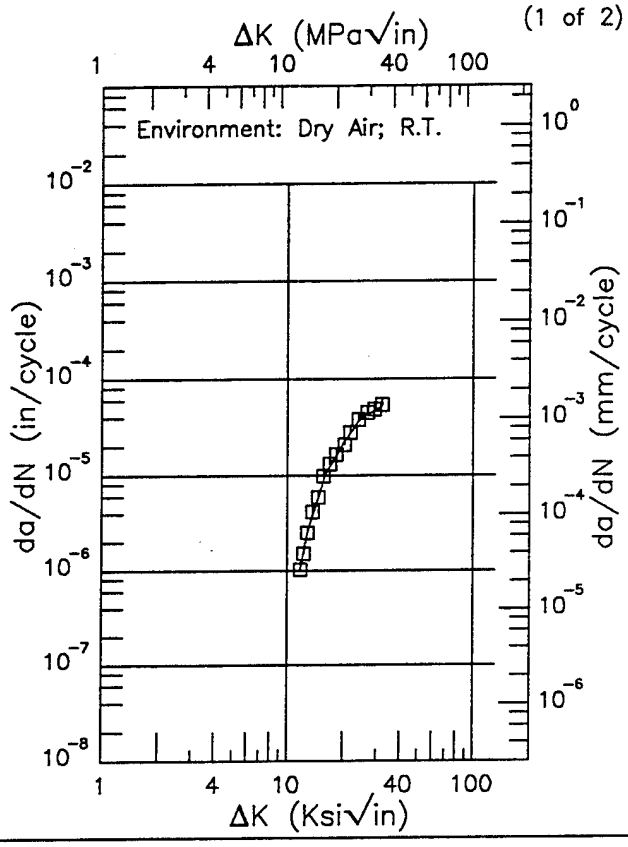
Figure 6.16.3.1.75

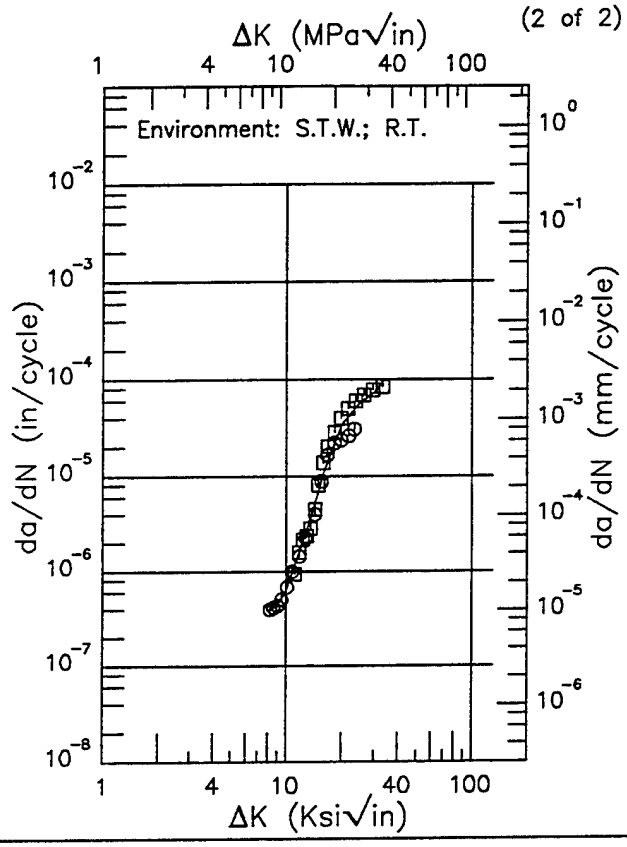
Ti–6Al–4V

E

Condition/Ht: MA
Form: 1.25 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.3
Frequency: 1 Hz

Yield Strength: 120 ksi
Ult. Strength: 134 ksi
Specimen Thk: 0.99 – 0.997 in.
Specimen Width: 6 – 6.01 in.
Ref: 85837



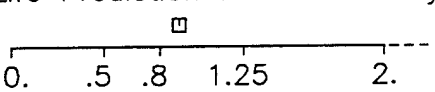


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.70 (min)	1.00
13.	2.76
16.	10.4
20.	21.6
25.	40.9
30.	47.5
32.09 (max)	53.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.19 (min)	0.388
9.	0.443
10.	0.629
13.	2.75
16.	10.7
20.	34.2
25.	57.1
30.	74.2
32.78 (max)	92.0

RMS % Error 5.42

Life Prediction Ratio Summary



RMS % Error 20.41

Life Prediction Ratio Summary

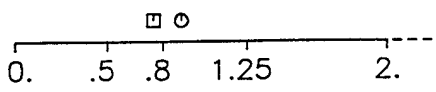
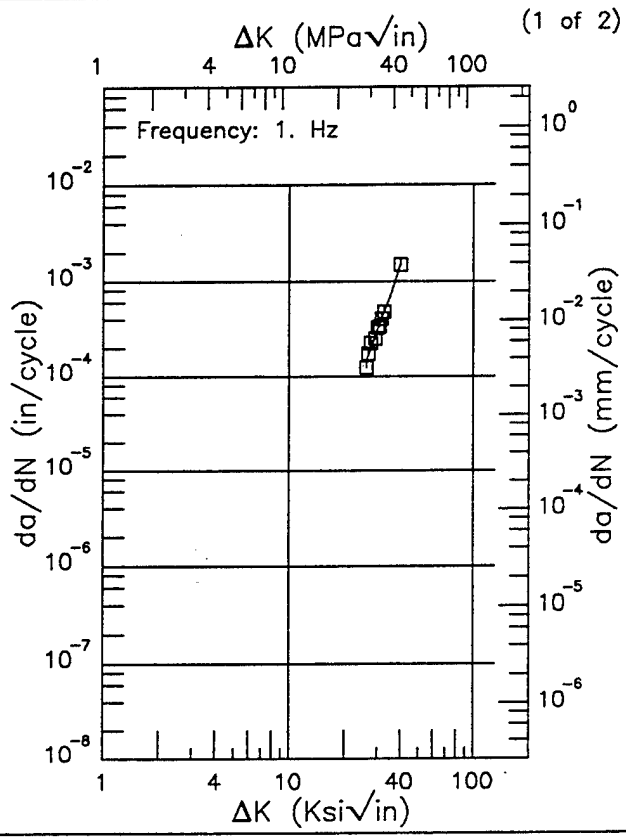


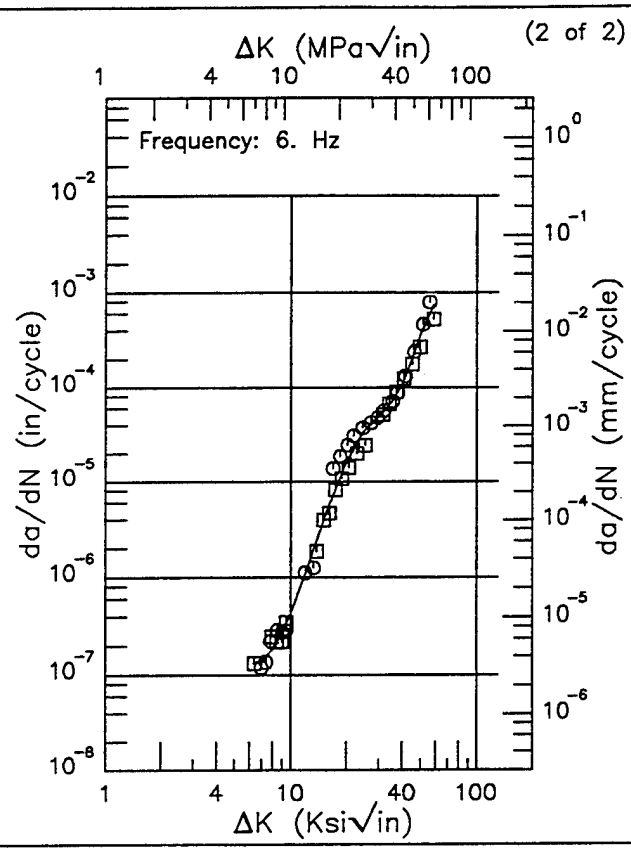
Figure 6.16.3.1.76

Ti–6Al–4V F

Condition/Ht: MA
Form: 0.63 – 1.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.3
Environment: DRY AIR; RT

Yield Strength: 120 – 138 ksi
Ult. Strength: 134 – 148 ksi
Specimen Thk: 0.67 – 1 in.
Specimen Width: 6 in.
Ref: 88579;84361;85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.05 (min)	144.
30.	313.
35.	679.
39.74 (max)	1469.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.36 (min)	0.131
7.	0.139
8.	0.183
9.	0.272
10.	0.426
13.	1.67
16.	5.32
20.	16.1
25.	34.5
30.	49.6
35.	68.8
40.	108.
50.	361.
58.57 (max)	747.

RMS % Error	Life Prediction Ratio Summary
7.17	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
26.46	0. .5 .8 1.25 2.

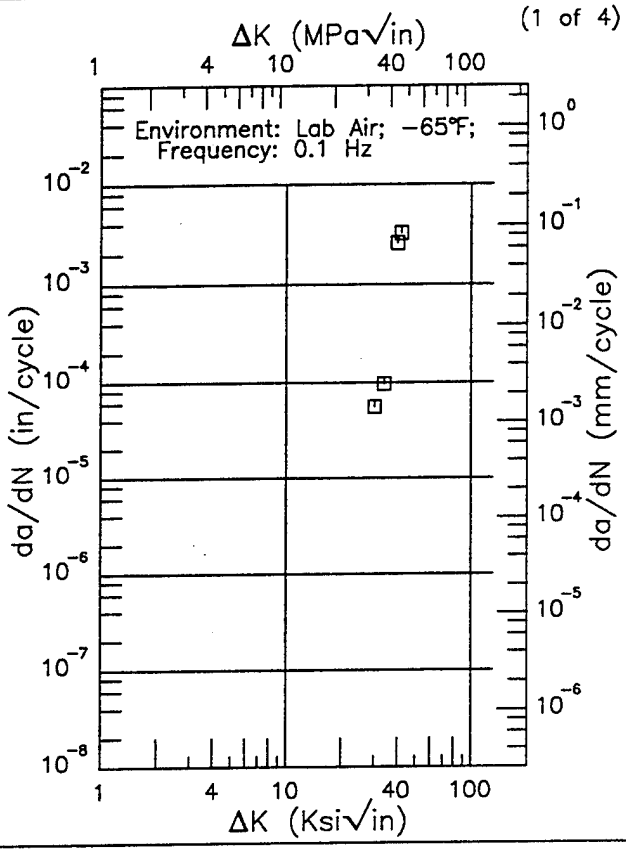
Figure 6.16.3.1.77

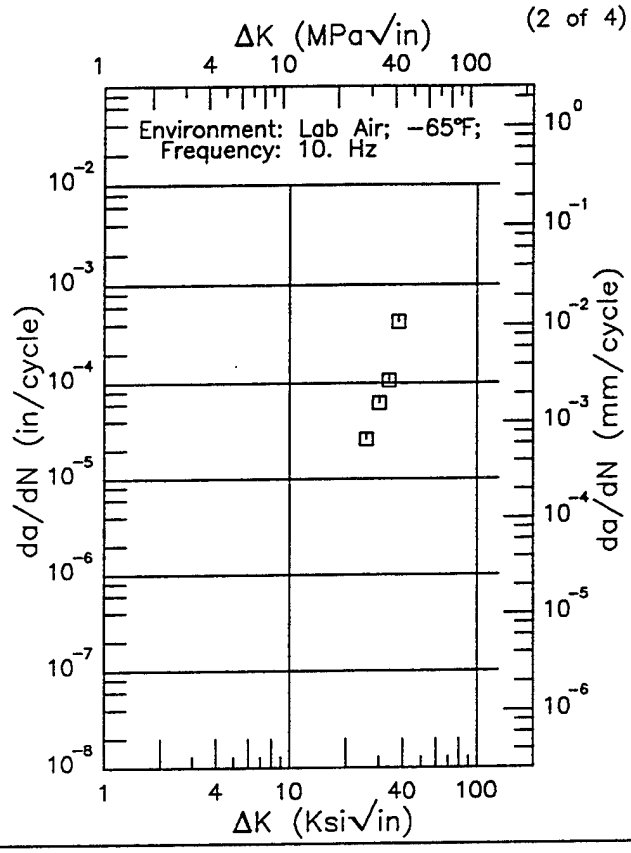
EF

Ti–6Al–4V

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

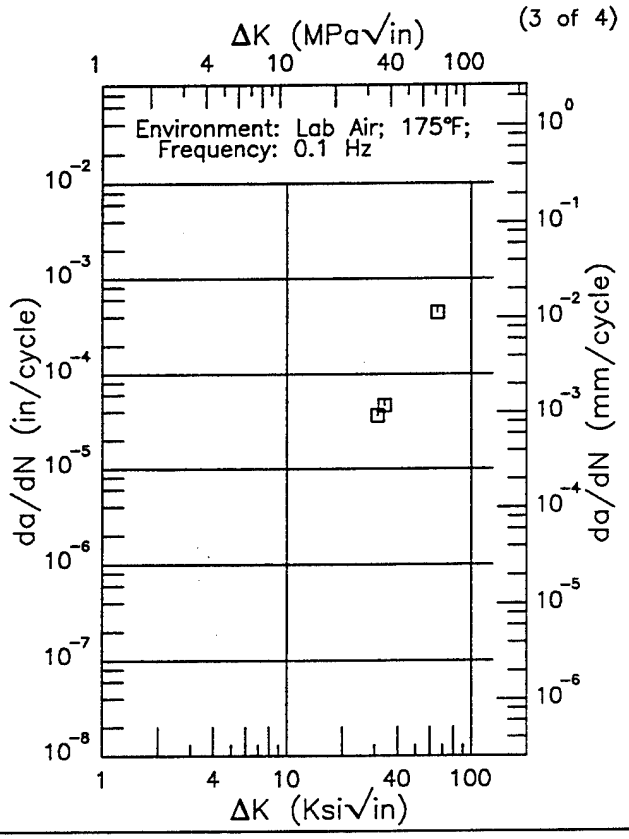
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

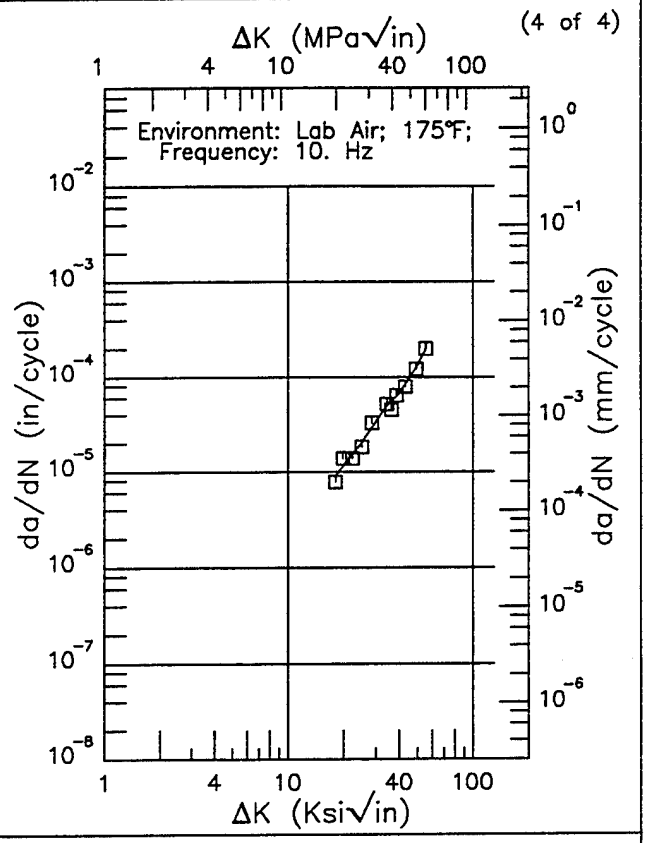
Figure 6.16.3.1.78

Ti–6Al–4V EF

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.93 (min)	8.94
20.	11.7
25.	20.0
30.	33.9
35.	52.4
40.	66.7
50.	134.
55.07 (max)	197.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
11.38	0. .5 .8 1.25 2.

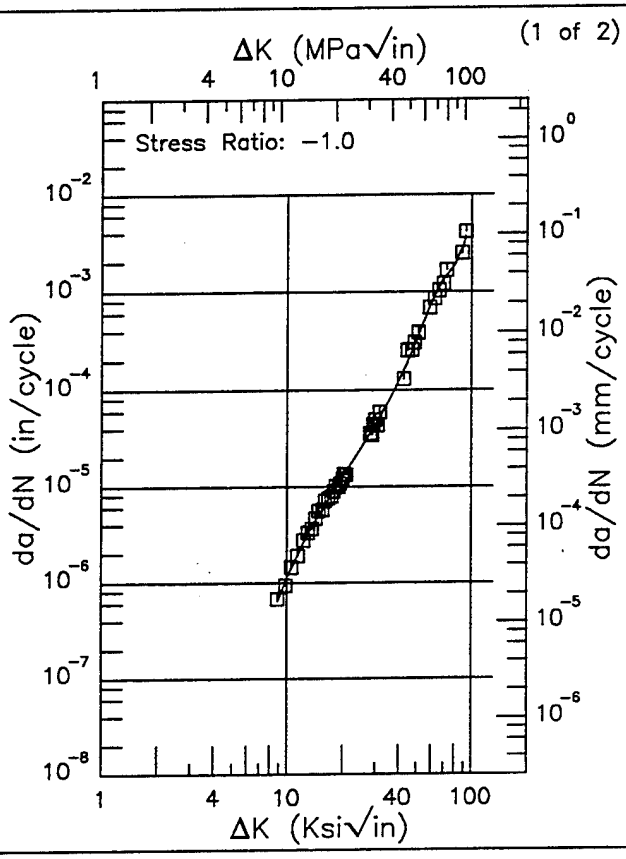
Figure 6.16.3.1.78 (Concluded)

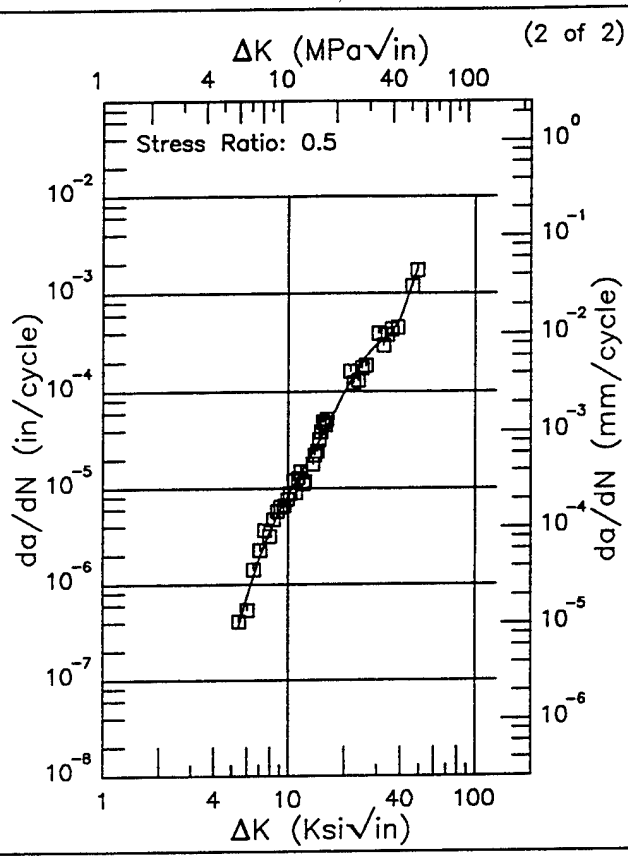
R

Ti–6Al–4V

Condition/Ht: MA
Form: 1 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength: 132.5 ksi
Ult. Strength: 138 ksi
Specimen Thk: 0.25 in.
Specimen Width: 4 in.
Ref: MA006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.85 (min)	0.640
9.	0.695
10.	1.14
13.	3.25
16.	6.53
20.	12.9
25.	25.1
30.	44.4
35.	75.1
40.	124.
50.	323.
60.	767.
70.	1356.
80.	1789.
90.	2992.
92.48 (max)	3717.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.43 (min)	0.359
6.	0.727
7.	1.82
8.	3.50
9.	5.74
10.	8.51
13.	20.4
16.	41.3
20.	97.2
25.	208.
30.	300.
35.	379.
40.	552.
49.27 (max)	1771.

RMS % Error	Life Prediction Ratio Summary
9.11	0. .5 .8 1.25 2.

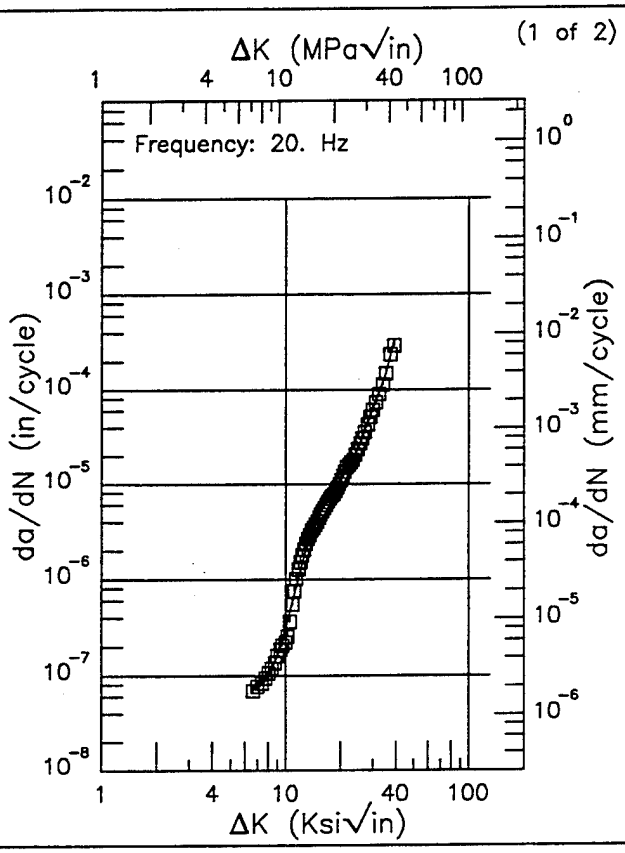
RMS % Error	Life Prediction Ratio Summary
18.52	0. .5 .8 1.25 2.

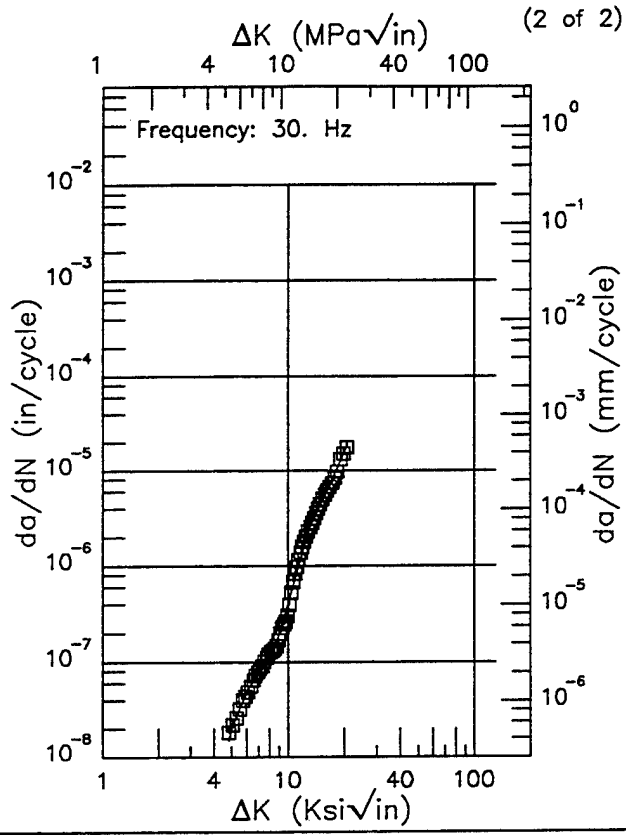
Figure 6.16.3.1.79

Ti–6Al–4V F

Condition/Ht: MA
Form: 0.38 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.02
Environment: LAB AIR; RT

Yield Strength: 137 ksi
Ult. Strength: 145 ksi
Specimen Thk: 0.241 – 0.242 in.
Specimen Width: 3.952 – 3.953 in.
Ref: MA002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.63 (min)	0.0805
7.	0.0750
8.	0.0933
9.	0.161
10.	0.317
13.	2.08
16.	5.96
20.	10.8
25.	24.1
30.	62.8
35.	144.
38.83 (max)	322.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.82 (min)	0.0149
5.	0.0198
6.	0.0494
7.	0.0759
8.	0.113
9.	0.198
10.	0.404
13.	2.48
16.	5.73
20.	15.8
20.57 (max)	18.2

RMS % Error	Life Prediction Ratio Summary
12.01	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.55	0. .5 .8 1.25 2.

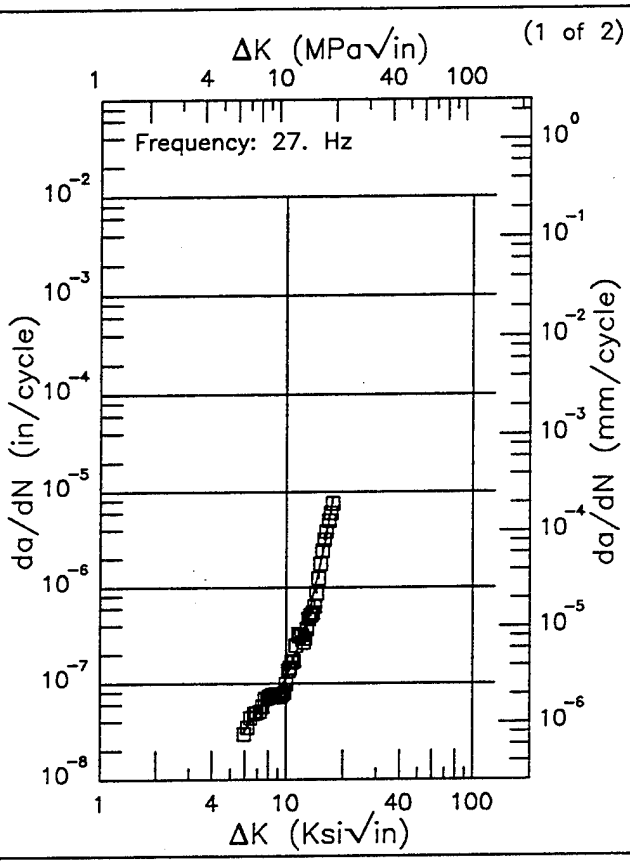
Figure 6.16.3.1.80

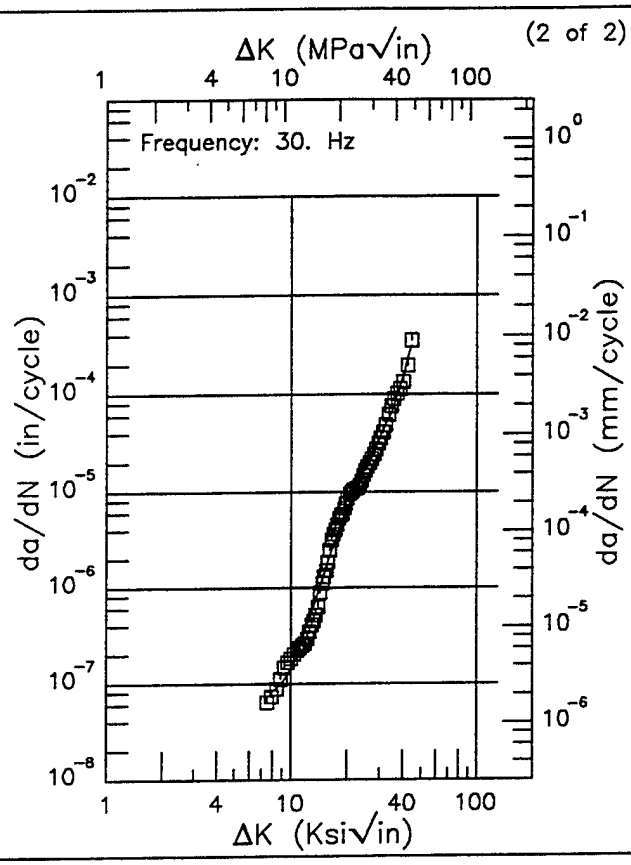
Ti–6Al–4V

F

Condition/Ht: MA
Form: 1.5 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.02
Environment: LAB AIR; RT

Yield Strength: 133 ksi
Ult. Strength: 142 ksi
Specimen Thk: 0.188 – 0.191 in.
Specimen Width: 3.957 – 3.964 in.
Ref: MA002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.91 (min)	0.0306
6.	0.0325
7.	0.0509
8.	0.0658
9.	0.0835
10.	0.113
13.	0.450
16.	3.03
17.49 (max)	8.73

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.47 (min)	0.0829
8.	0.0833
9.	0.102
10.	0.145
13.	0.563
16.	1.98
20.	6.77
25.	18.4
30.	35.8
35.	68.5
40.	148.
44.29 (max)	306.

RMS % Error	Life Prediction Ratio Summary
14.69	0. .5 .8 1.25 2.

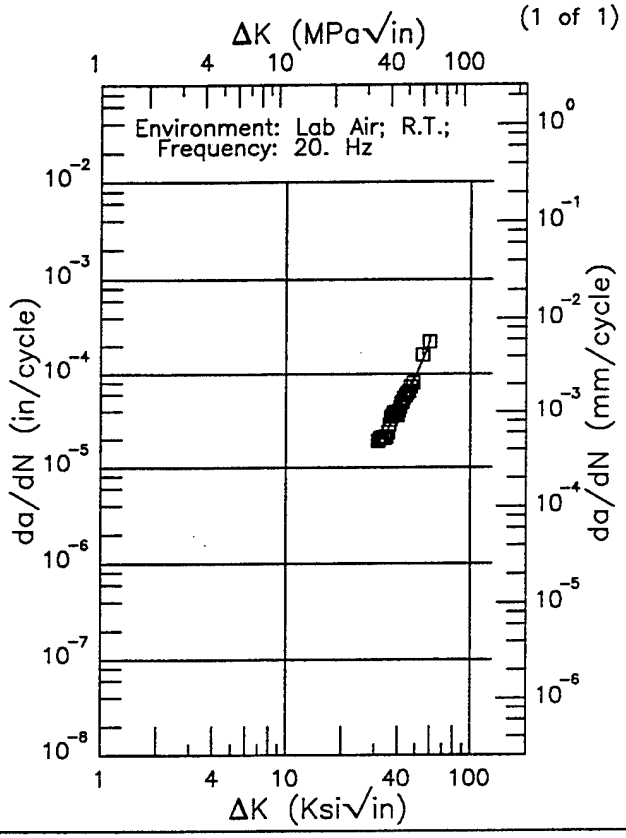
RMS % Error	Life Prediction Ratio Summary
18.82	0. .5 .8 1.25 2.

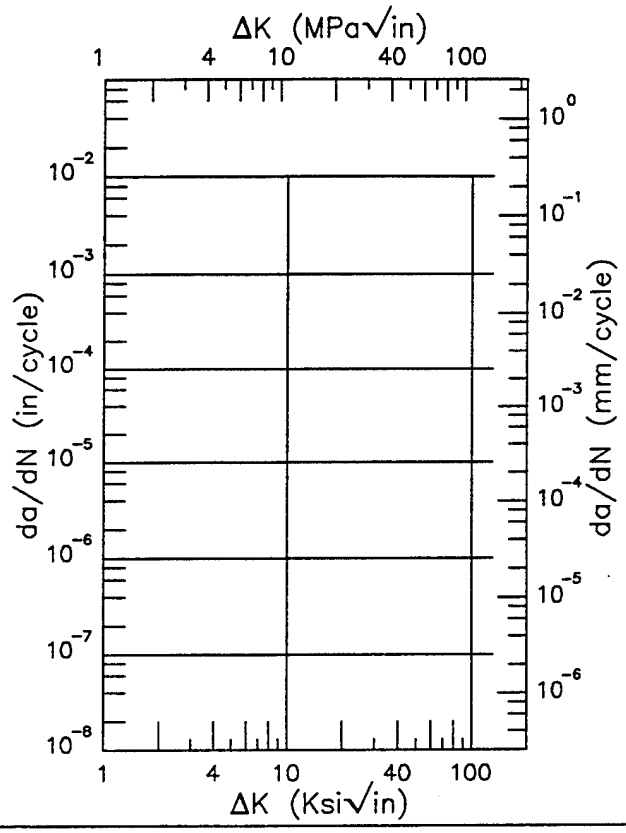
Figure 6.16.3.1.81

Ti–6Al–4V EF

Condition/Ht: MA
Form: 0.75 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Stress Ratio: 0.04

Yield Strength: 135.3 ksi
Ult. Strength: 137.6 ksi
Specimen Thk: 0.29 in.
Specimen Width: 6.011 in.
Ref: 88468





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
31.29 (min)	18.7
35.	24.3
40.	41.3
50.	93.2
59.30 (max)	220.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.38	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

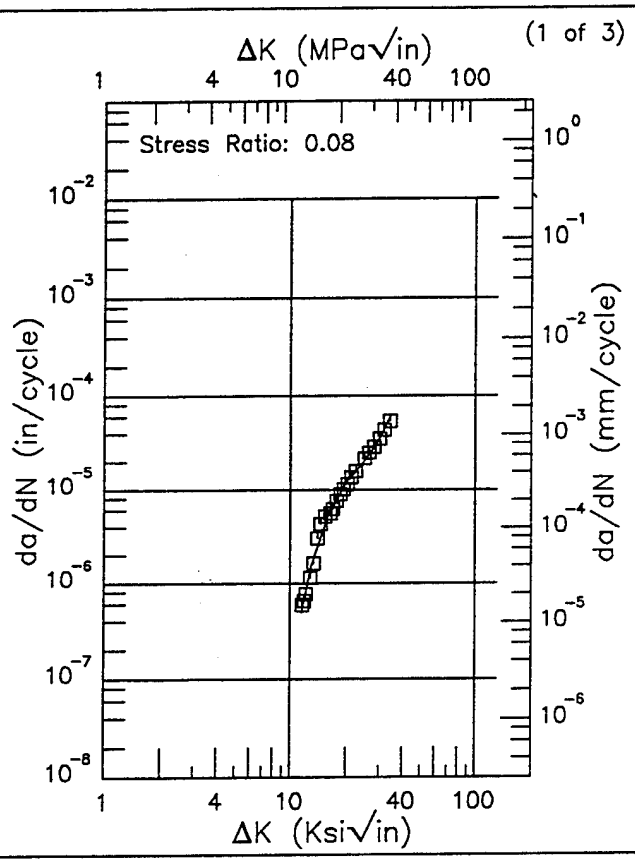
Figure 6.16.3.1.82

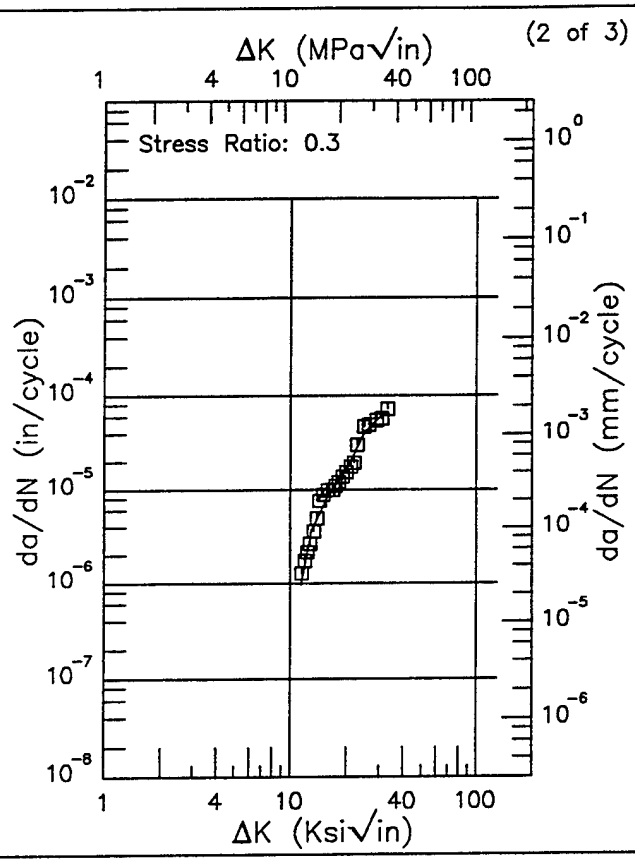
R

Ti–6Al–4V

Condition/Ht: MA
Form: Extrusion
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 123.5 ksi
Ult. Strength: 135.5 ksi
Specimen Thk: 0.993 – 0.995 in.
Specimen Width: 3.77 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.52 (min)	0.496
13.	1.51
16.	5.47
20.	12.0
25.	20.6
30.	34.7
34.01 (max)	58.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.48 (min)	0.973
13.	3.65
16.	8.87
20.	16.4
25.	41.2
30.	59.0
32.86 (max)	68.4

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
13.66	0. .5 .8 1.25 2.	14.94	0. .5 .8 1.25 2.

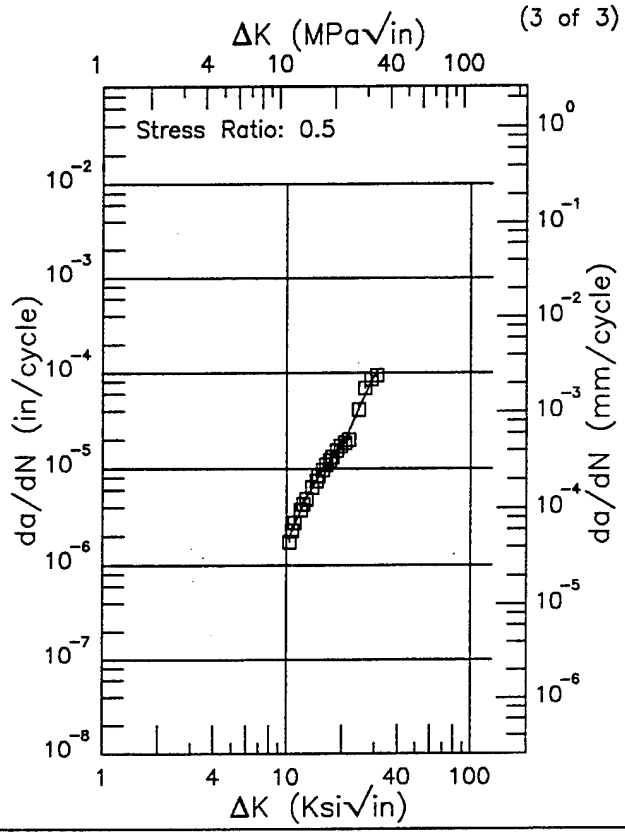
Figure 6.16.3.1.83

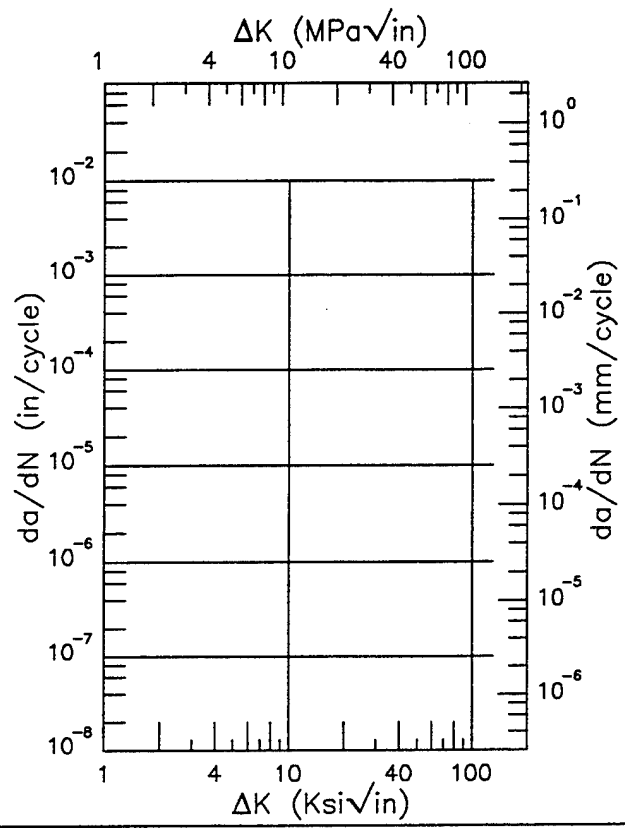
Ti–6Al–4V R

Condition/Ht: MA
Form: Extrusion
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 123.5 ksi
Ult. Strength: 135.5 ksi
Specimen Thk: 0.993 – 0.995 in.
Specimen Width: 3.77 in.
Ref: 85837

(3 of 3)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.32 (min)	1.94
13.	5.28
16.	10.3
20.	16.9
25.	45.6
30.	96.0
30.83 (max)	90.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
7.05	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

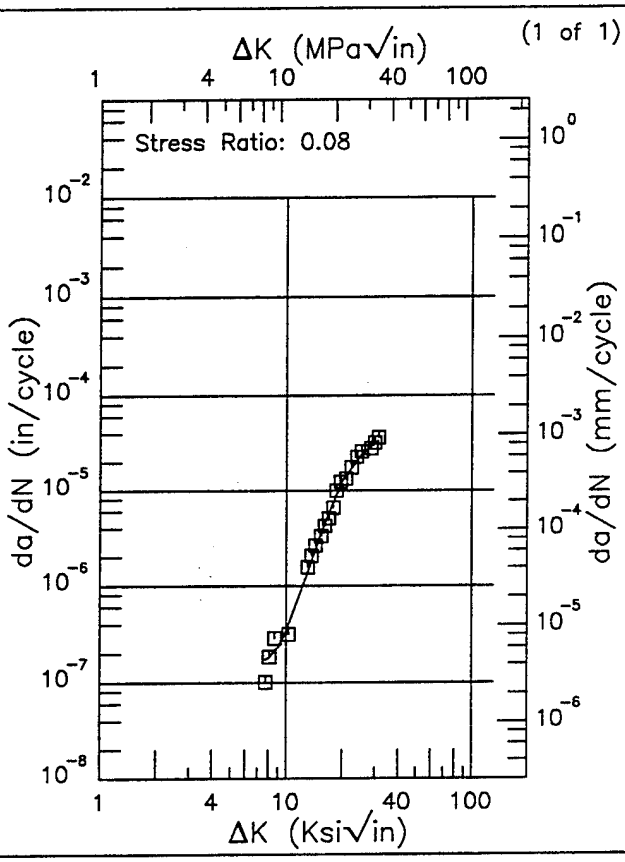
Figure 6.16.3.1.83 (Concluded)

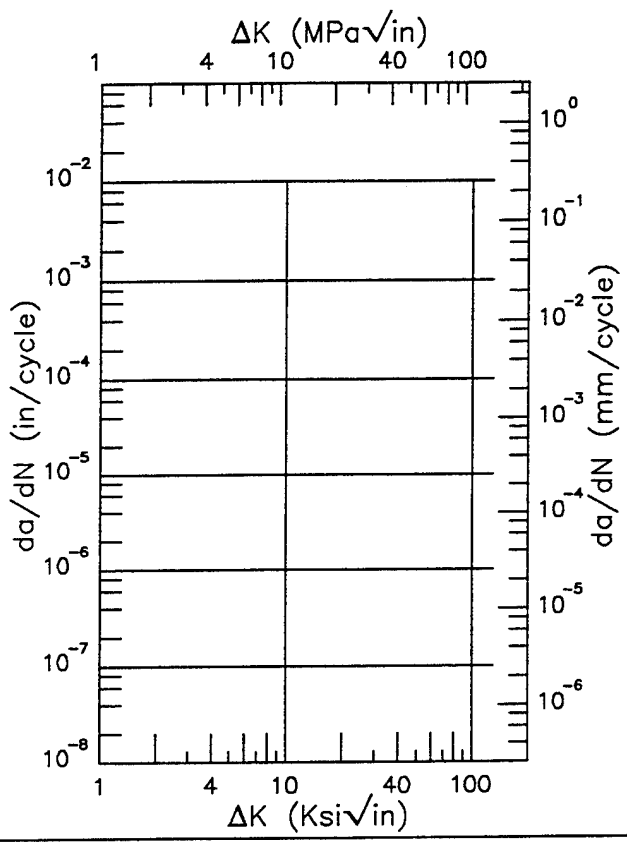
R

Ti–6Al–4V

Condition/Ht: MA
Form: Extrusion
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 122 ksi
Ult. Strength: 139 ksi
Specimen Thk: 0.997 in.
Specimen Width: 4.94 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.76 (min)	0.175
8.	0.180
9.	0.231
10.	0.340
13.	1.33
16.	4.40
20.	12.6
25.	23.4
30.	31.8
31.20 (max)	33.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 15.69

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

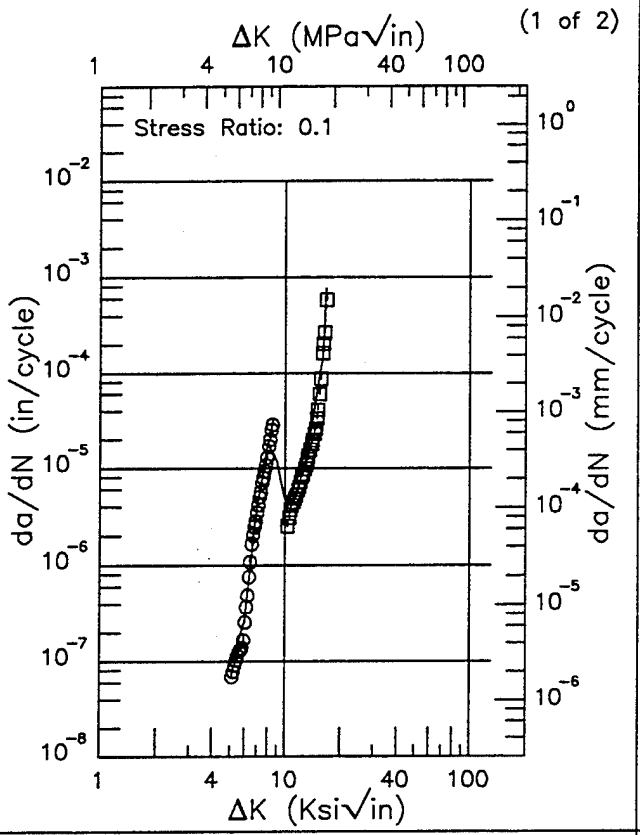
Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

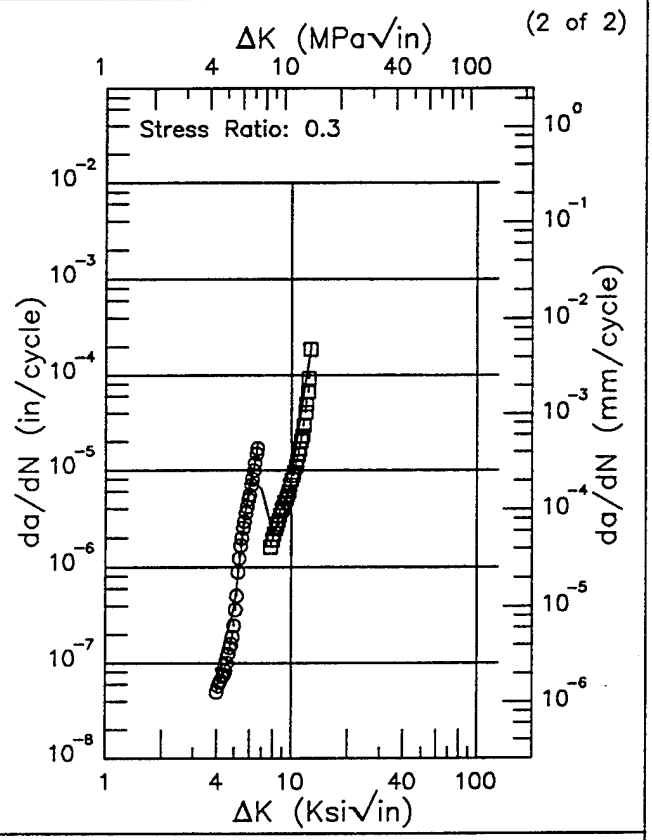
Figure 6.16.3.1.84

Ti–6Al–4V R

Condition/Ht: MA
Form: Extrusion
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.251 in.
Specimen Width: 2 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.10 (min)	0.0946
6.	0.259
7.	4.01
8.	18.2
9.	11.9
10.	4.64
13.	11.9
16.	152.
16.69 (max)	778.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.97 (min)	0.0878
4.	0.0802
5.	0.394
6.	8.21
7.	6.36
8.	2.22
9.	3.07
10.	8.82
12.66 (max)	210.

RMS % Error 29.84

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

RMS % Error 40.20

Life Prediction Ratio Summary
0. .5 .8 1.25 2.

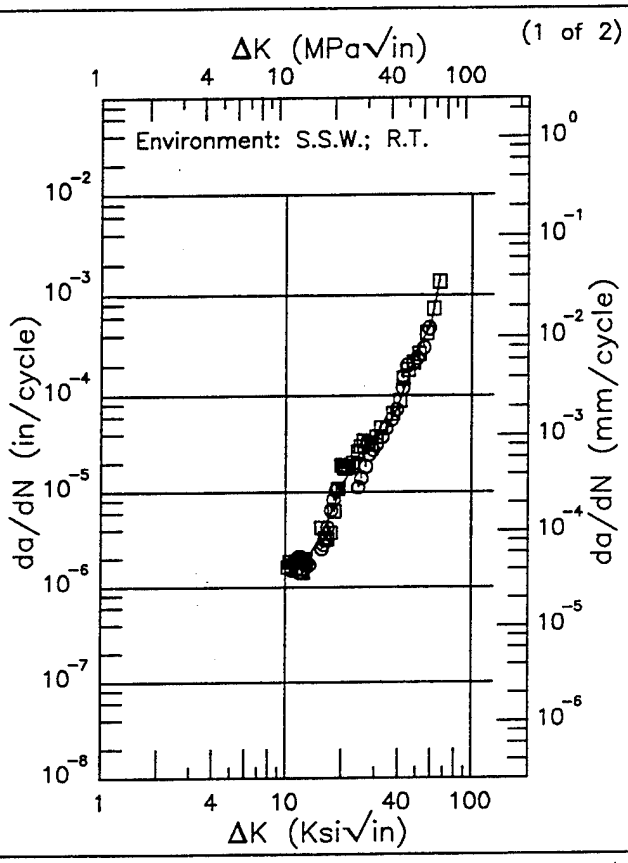
Figure 6.16.3.1.85

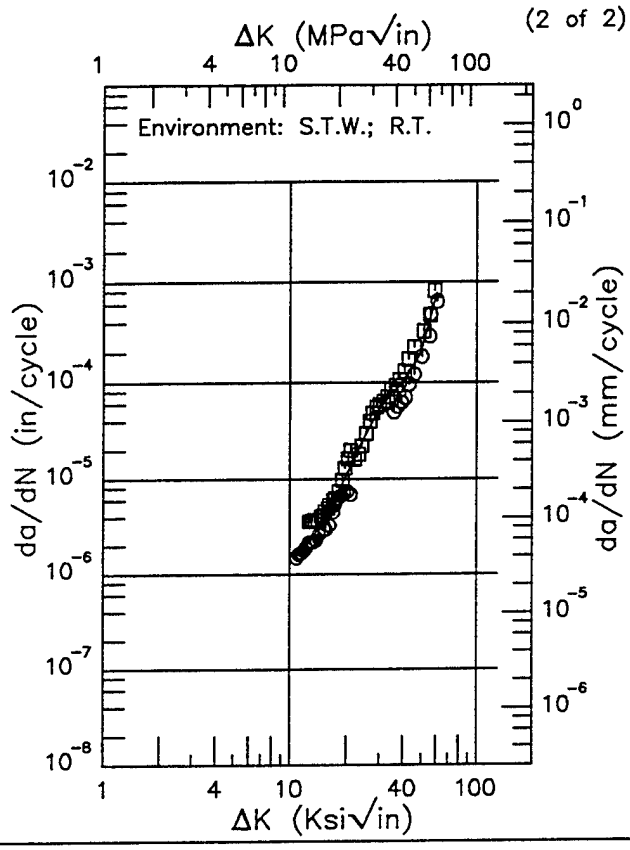
Ti–6Al–4V

E

Condition/Ht: MA
Form: 1.8 in. Extrusion
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Frequency: 1 – 10 Hz

Yield Strength: 124.4 ksi
Ult. Strength: 135.3 ksi
Specimen Thk: 1.001 – 1.003 in.
Specimen Width: 4.5 in.
Ref: NC002



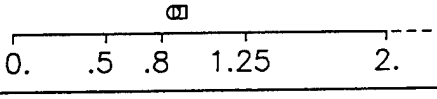


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.22 (min)	1.83
13.	1.87
16.	3.96
20.	11.4
25.	25.6
30.	34.7
35.	46.8
40.	78.9
50.	270.
60.	512.
66.66 (max)	1477.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.86 (min)	1.62
13.	2.30
16.	4.47
20.	10.9
25.	27.5
30.	53.2
35.	79.7
40.	98.8
50.	210.
60.	727.
60.69 (max)	779.

RMS % Error 21.82

Life Prediction Ratio Summary



RMS % Error 24.03

Life Prediction Ratio Summary

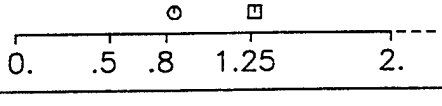
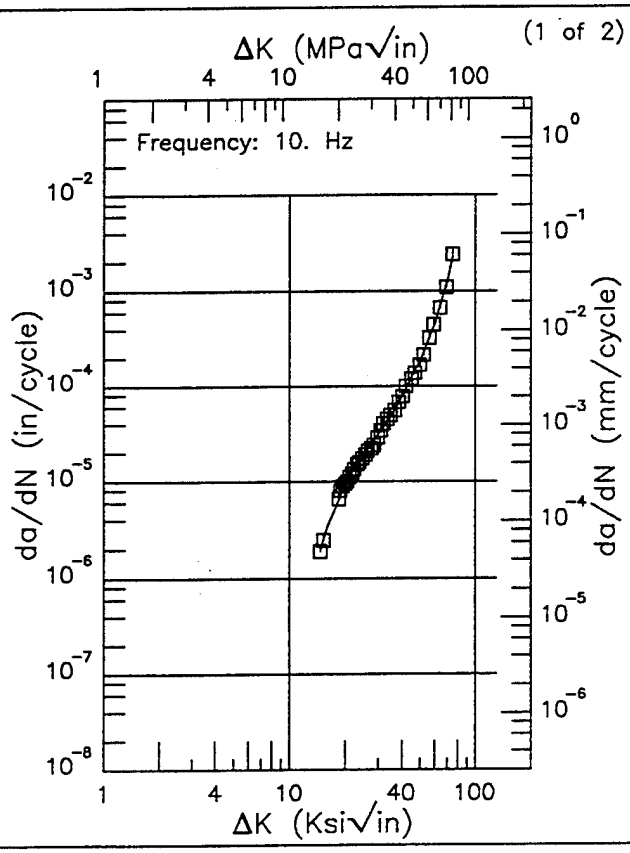


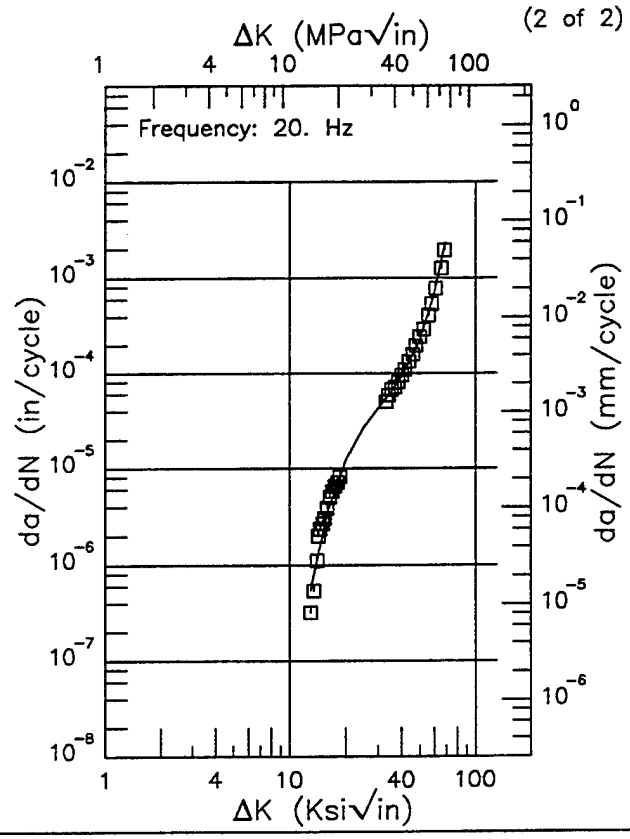
Figure 6.16.3.1.86

Ti–6Al–4V F

Condition/Ht: MA
Form: 1.8 in. Extrusion
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 124.4 ksi
Ult. Strength: 135.3 ksi
Specimen Thk: 1 – 1.002 in.
Specimen Width: 4.5 in.
Ref: NC002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.66 (min)	2.01
16.	3.39
20.	9.35
25.	19.0
30.	31.0
35.	48.5
40.	76.4
50.	189.
60.	453.
70.	1240.
74.97 (max)	2288.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.95 (min)	0.540
13.	0.563
16.	3.46
20.	12.2
25.	26.8
30.	42.7
35.	62.3
40.	91.3
50.	226.
60.	702.
67.89 (max)	1997.

RMS % Error	Life Prediction Ratio Summary
6.26	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
20.89	0. .5 .8 1.25 2.

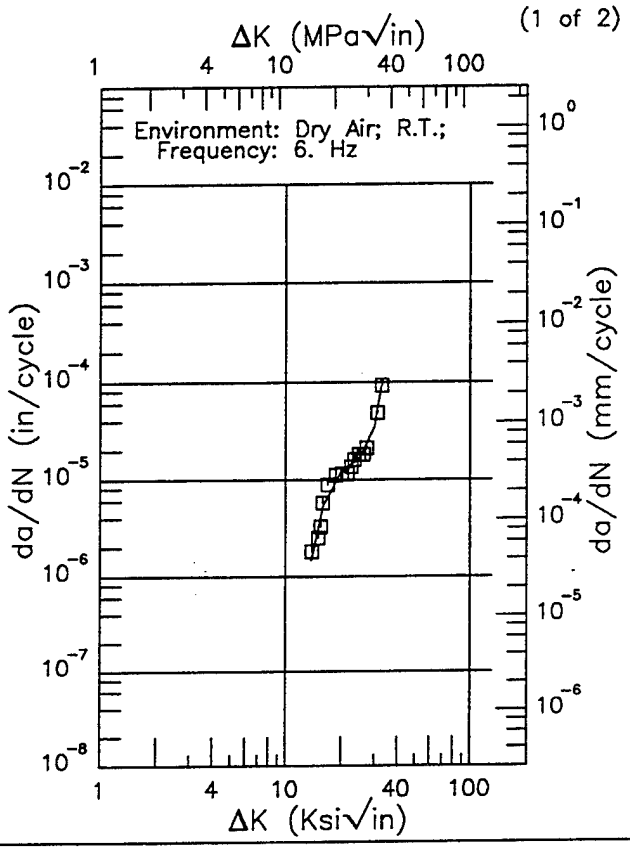
Figure 6.16.3.1.87

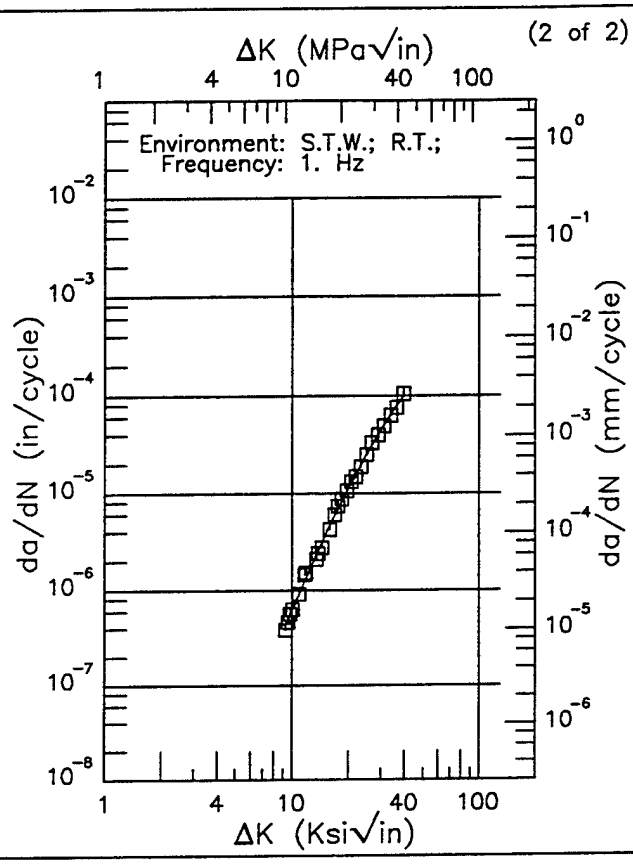
Ti–6Al–4V

EF

Condition/Ht: MA
Form: Extrusion
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08

Yield Strength: 125 ksi
Ult. Strength: 142 ksi
Specimen Thk: 0.994 in.
Specimen Width: 3.77 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.81 (min)	1.47
16.	5.48
20.	12.1
25.	16.5
30.	35.4
32.77 (max)	89.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.22 (min)	0.428
10.	0.620
13.	1.97
16.	4.67
20.	11.1
25.	24.8
30.	45.1
35.	71.6
39.27 (max)	98.5

RMS % Error	Life Prediction Ratio Summary
15.22	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
6.87	0. .5 .8 1.25 2.

Figure 6.16.3.1.88

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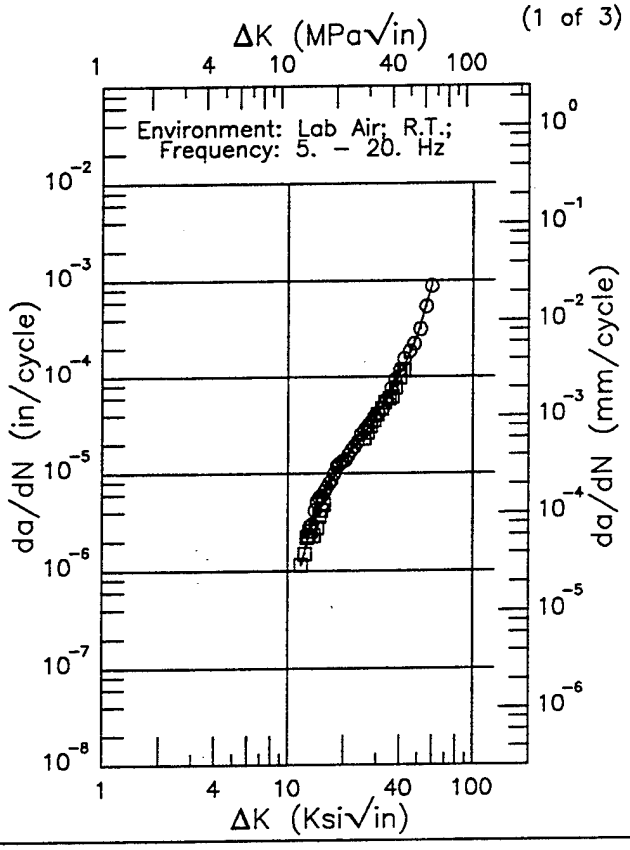
Ti–6Al–4V

EF

Condition/Ht: MA
Form: 1.8 in. Extrusion
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

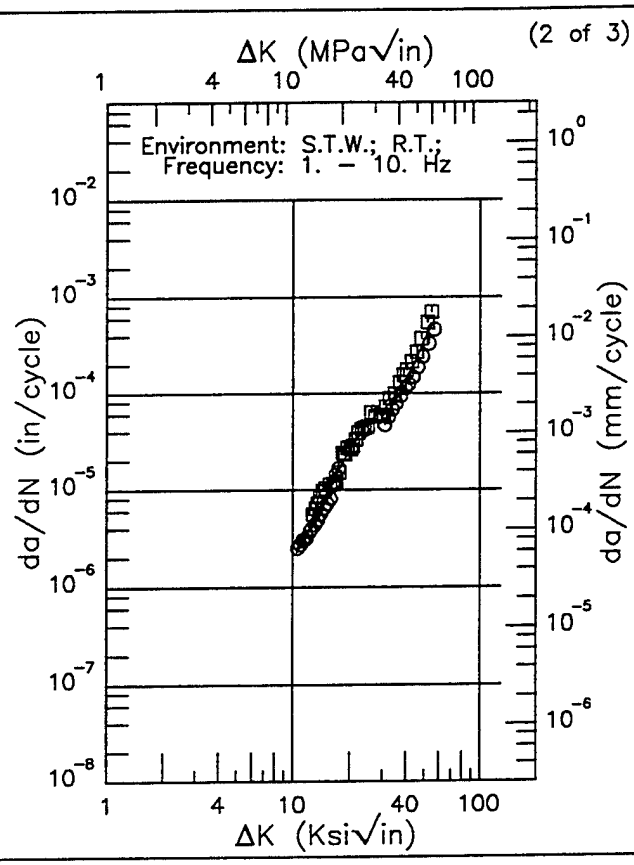
Yield Strength: 126.6 ksi
Ult. Strength: 138.6 ksi
Specimen Thk: 1 – 1.003 in.
Specimen Width: 4.5 in.
Ref: NC002

(1 of 3)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.73 (min)	1.14
13.	2.33
16.	6.65
20.	13.7
25.	23.8
30.	38.5
35.	63.0
40.	103.
50.	277.
59.40 (max)	865.

(2 of 3)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.58 (min)	2.30
13.	4.95
16.	11.3
20.	25.9
25.	48.8
30.	66.6
35.	86.0
40.	124.
50.	354.
56.74 (max)	587.

RMS % Error	Life Prediction Ratio Summary
11.93	0. .5 .8 1.25 2.

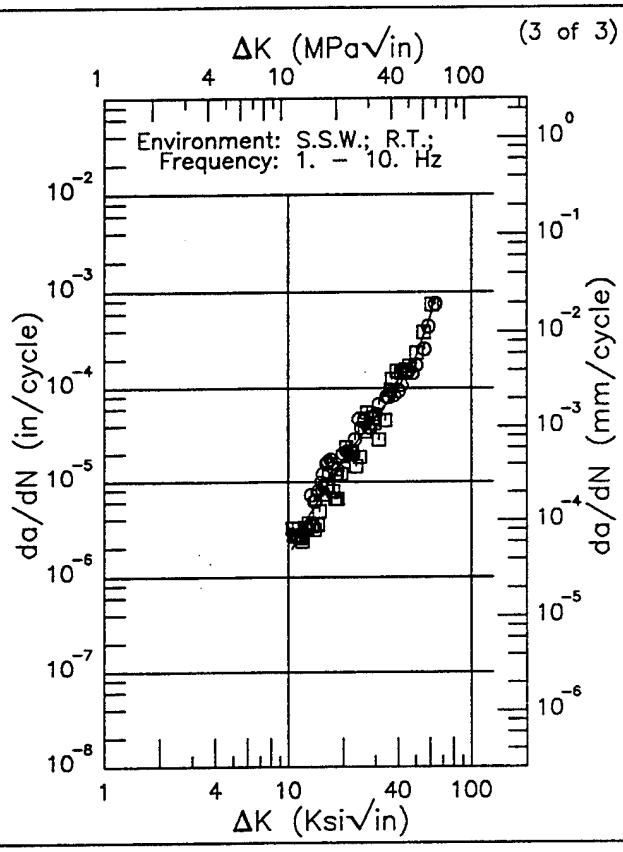
RMS % Error	Life Prediction Ratio Summary
18.13	0. .5 .8 1.25 2.

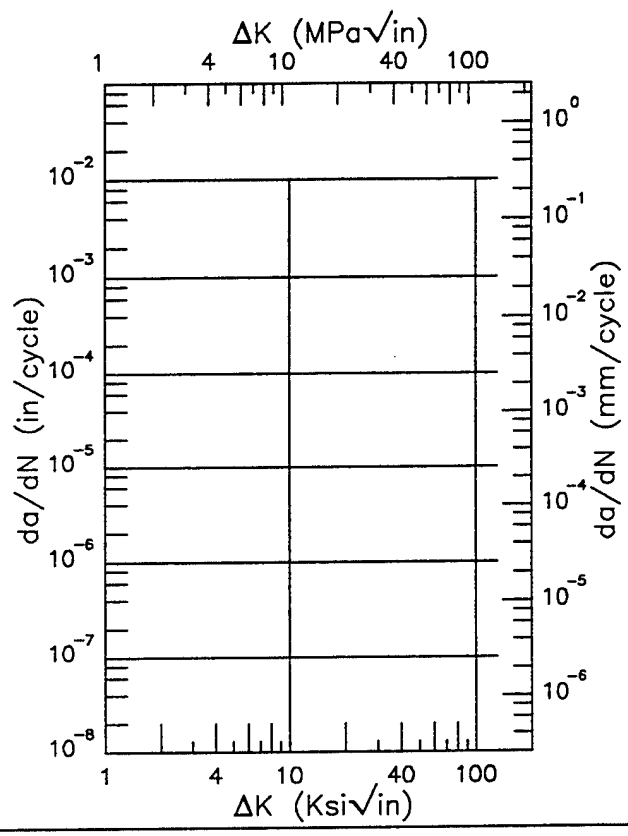
Figure 6.16.3.1.89

Ti–6Al–4V EF

Condition/Ht: MA
Form: 1.8 in. Extrusion
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength: 126.6 ksi
Ult. Strength: 138.6 ksi
Specimen Thk: 1 – 1.003 in.
Specimen Width: 4.5 in.
Ref: NC002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.52 (min)	1.95
13.	4.39
16.	8.83
20.	17.2
25.	31.2
30.	49.1
35.	71.8
40.	102.
50.	209.
60.	560.
63.55 (max)	899.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 29.88

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

Figure 6.16.3.1.89 (Concluded)

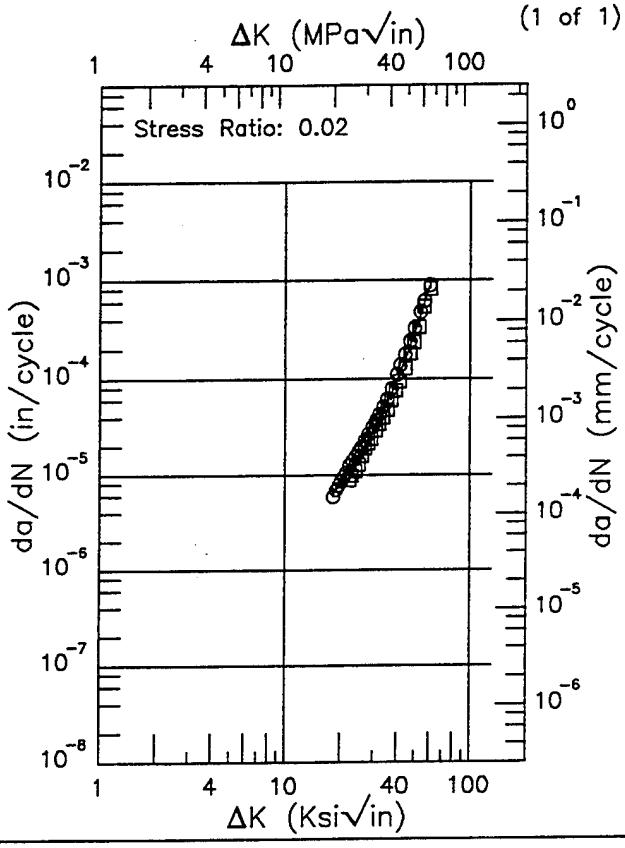
R

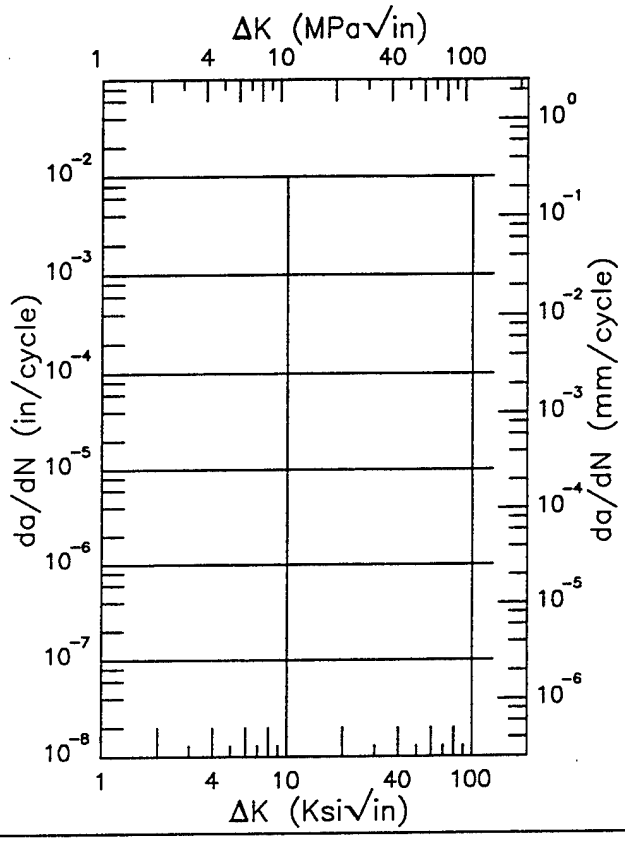
Ti–6Al–4V

Condition/Ht: MA
Form: 4.5 in. Forging
Specimen Type: WOL
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 130 ksi
Ult. Strength: 139 ksi
Specimen Thk: 0.553 – 0.555 in.
Specimen Width: 4.999 – 5 in.
Ref: MA002

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.15 (min)	6.34
20.	8.18
25.	15.7
30.	29.2
35.	53.0
40.	95.0
50.	292.
60.	857.
60.61 (max)	914.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
12.44	0. .5 .8 1.25 2.

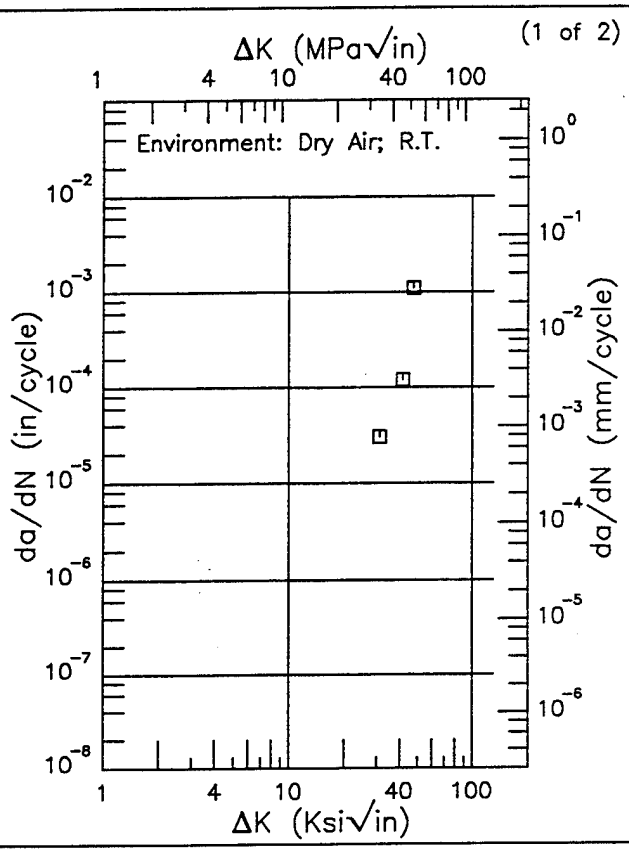
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

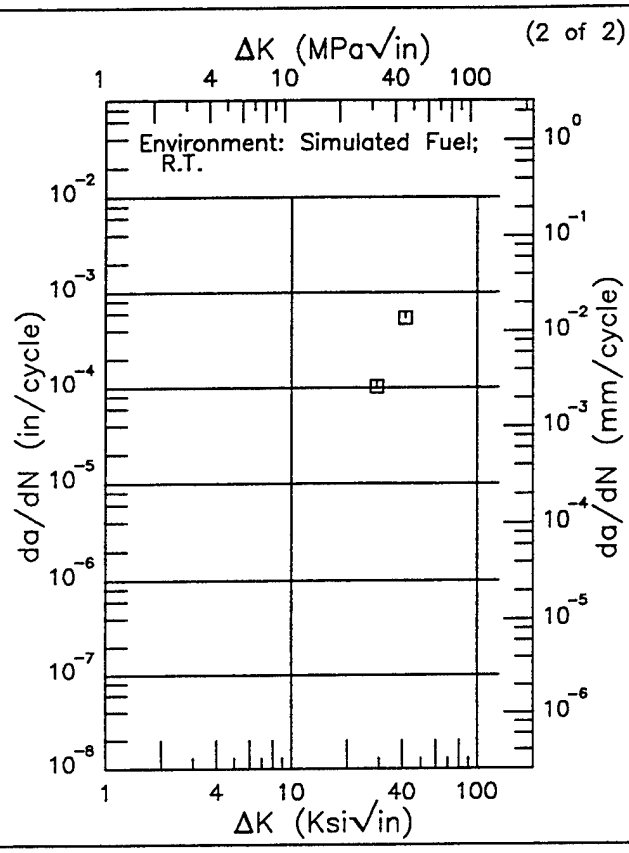
Figure 6.16.3.1.90

Ti–6Al–4V E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 0.1 Hz

Yield Strength: 145 ksi
Ult. Strength: 156 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

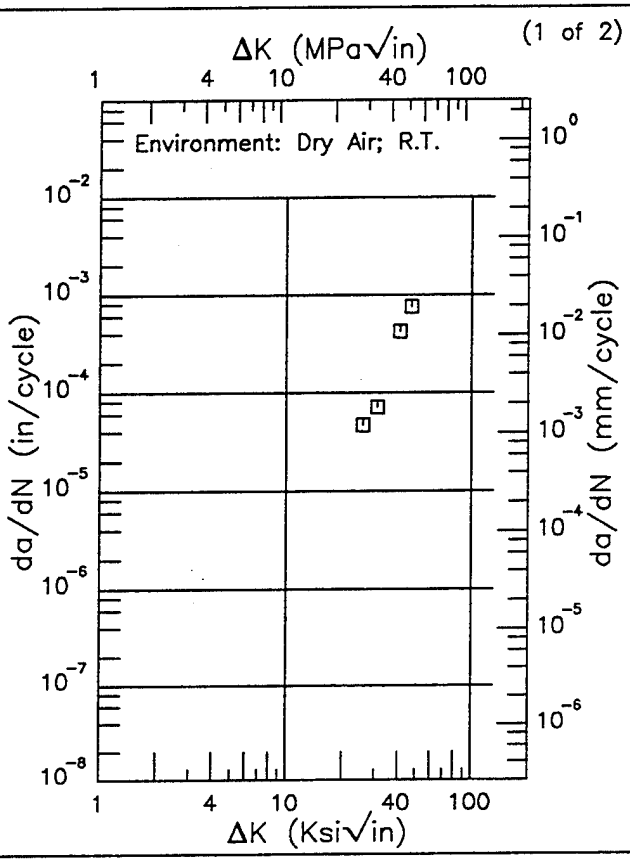
Figure 6.16.3.1.91

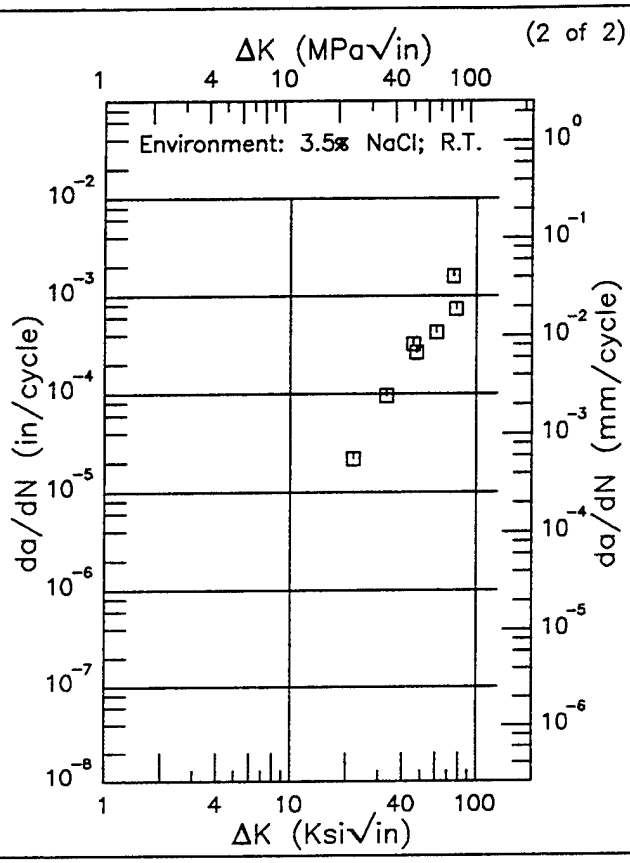
Ti–6Al–4V

E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 1 Hz

Yield Strength: 145 ksi
Ult. Strength: 156 ksi
Specimen Thk: 0.75 – 0.875 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

Figure 6.16.3.1.92

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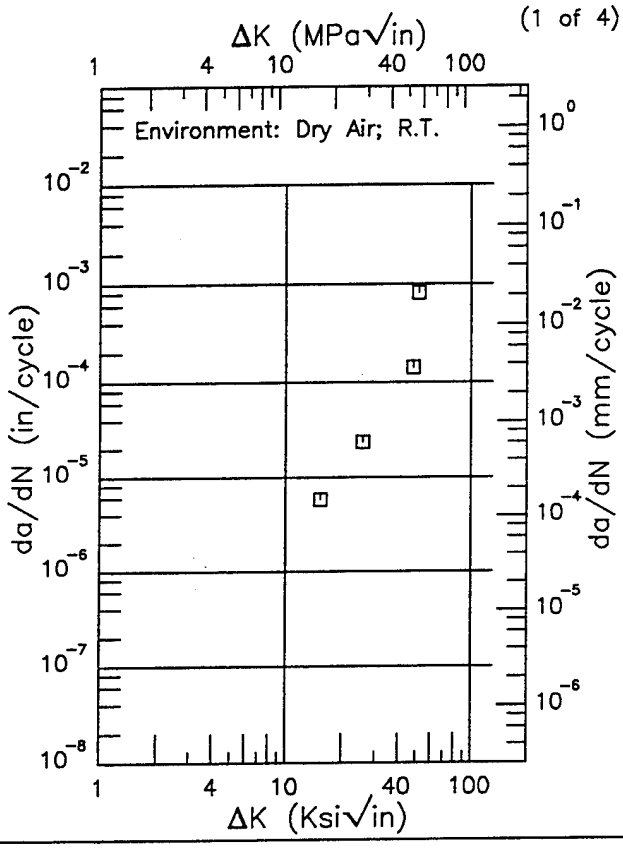
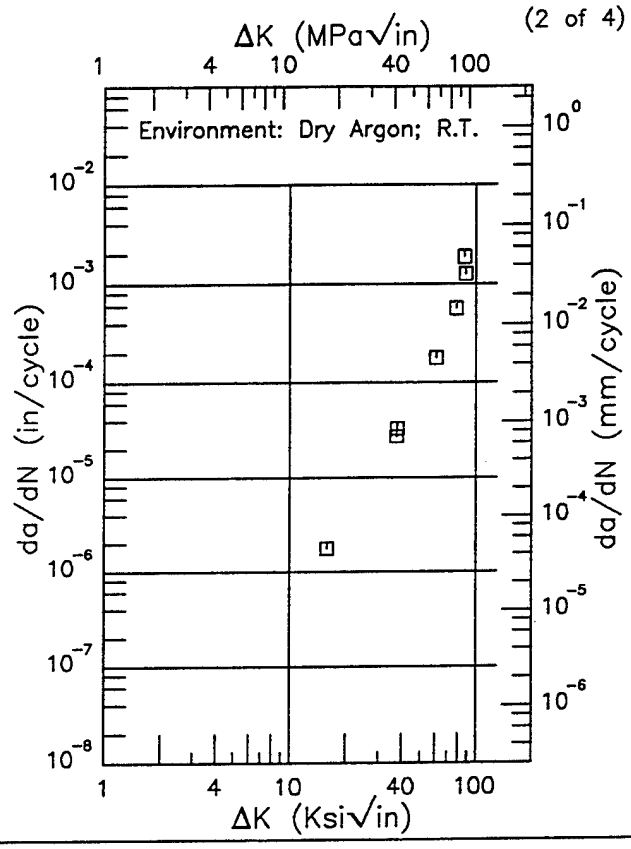
Ti–6Al–4V

E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 10 Hz

Yield Strength: 127 – 145 ksi
Ult. Strength: 139 – 156 ksi
Specimen Thk: 0.75 – 0.875 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

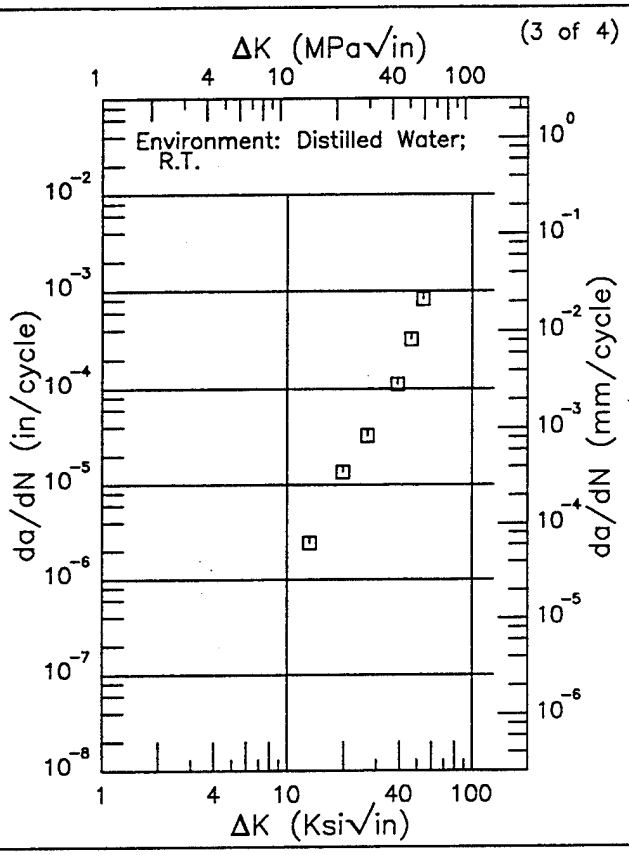
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

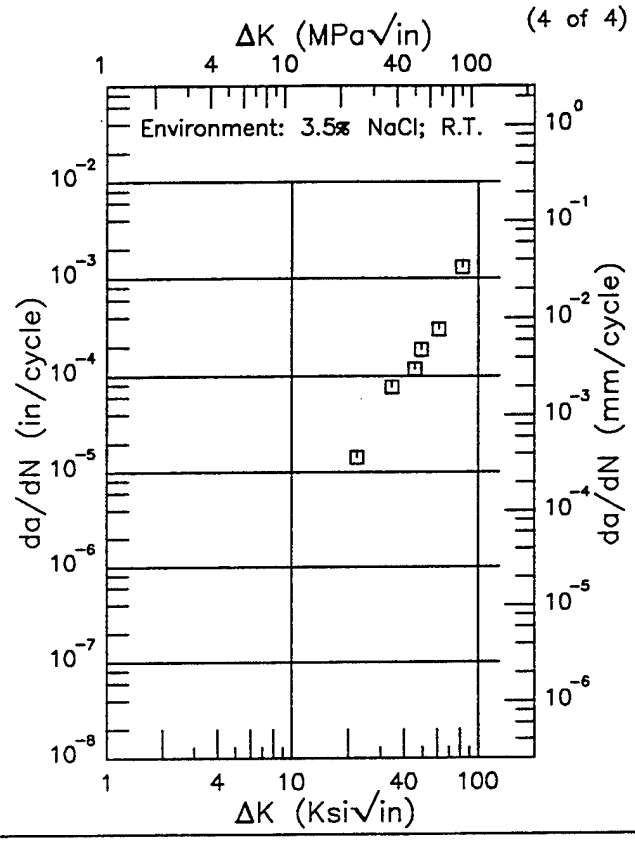
Figure 6.16.3.1.93

Ti–6Al–4V E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 10 Hz

Yield Strength: 127 – 145 ksi
Ult. Strength: 139 – 156 ksi
Specimen Thk: 0.75 – 0.875 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

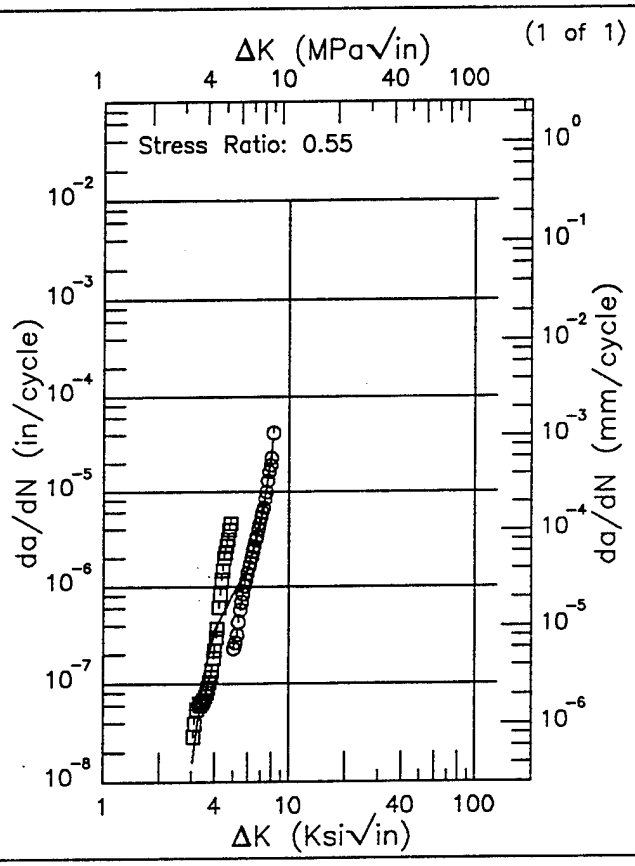
Figure 6.16.3.1.93 (Concluded)

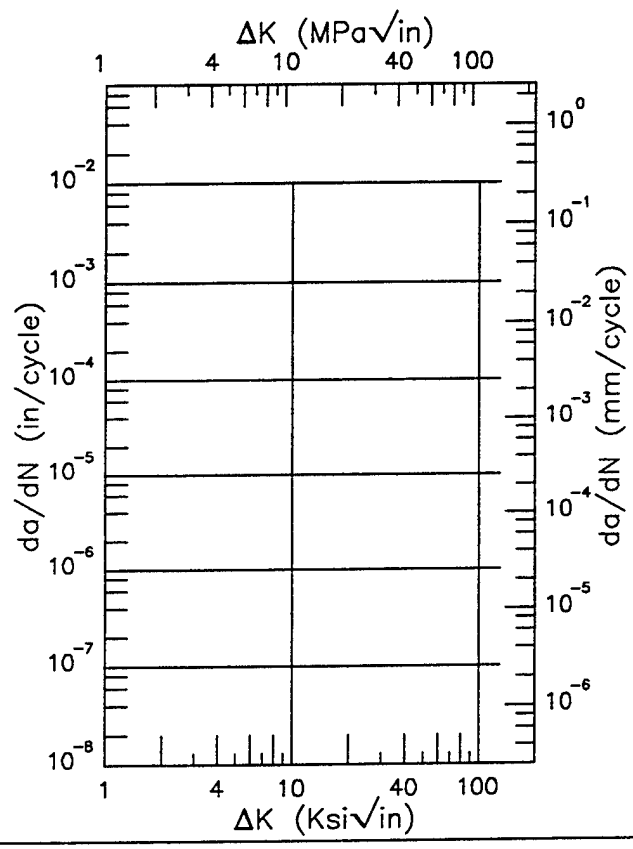
R

Ti–6Al–4V

Condition/Ht: MA
Form:
Specimen Type: CT
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.25 – 0.251 in.
Specimen Width: 2 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
3.06 (min)	0.0159
3.5	0.116
4.	0.356
5.	0.844
6.	1.56
7.	4.56
8.	25.7
8.17 (max)	36.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error >100.0

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

Figure 6.16.3.1.94

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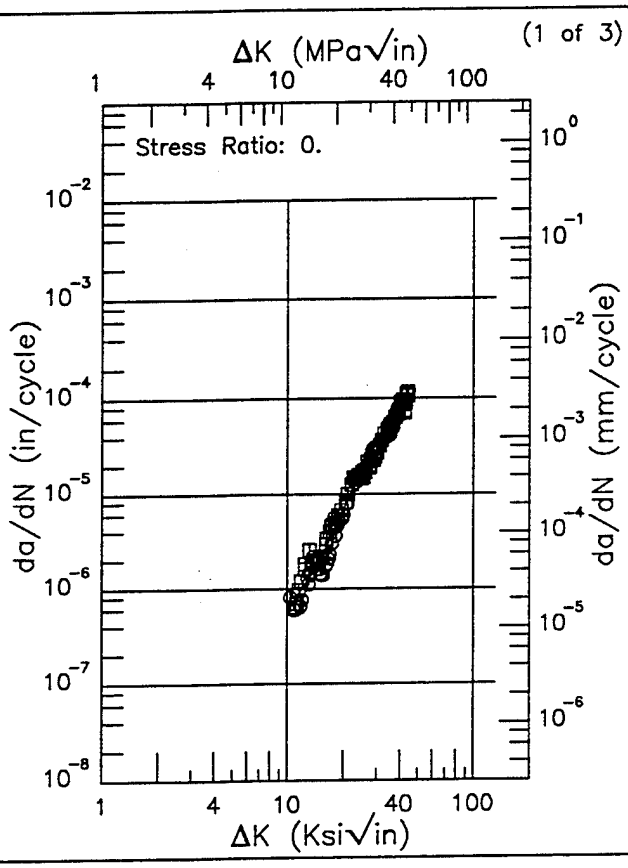
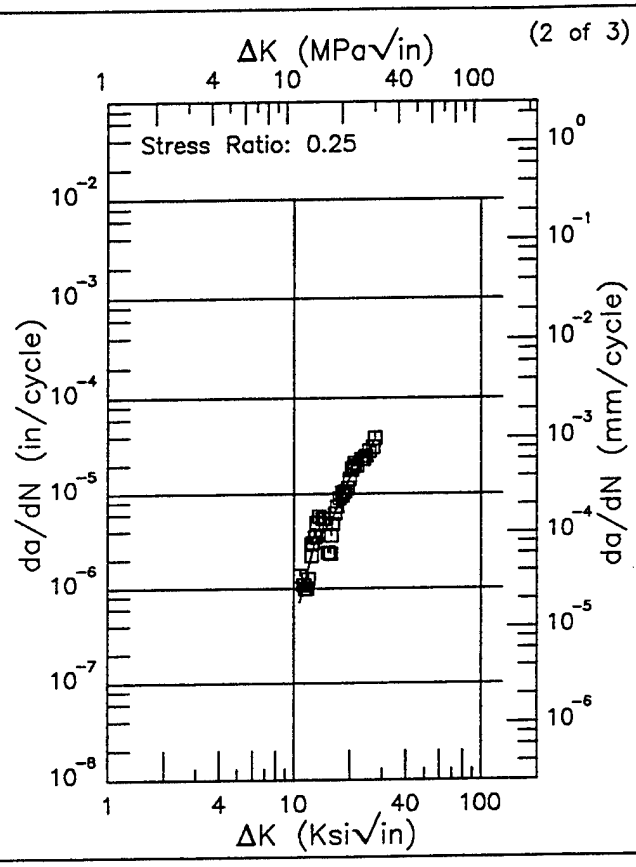
Ti–6Al–4V

R

Condition/Ht: MA 1300F 2HRS AC
Form: 1.75 in. Disk
Specimen Type: KB Bar
Orientation: L–R
Frequency: 0.3 Hz
Environment: LAB AIR;300°F

Yield Strength: 120 ksi
Ult. Strength:
Specimen Thk: 0.244 – 0.25 in.
Specimen Width: 1 – 1.005 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.32 (min)	0.649
13.	1.26
16.	2.67
20.	6.90
25.	17.7
30.	29.8
35.	45.9
40.	82.0
44.22 (max)	102.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.79 (min)	0.707
13.	3.05
16.	5.14
20.	14.9
25.	26.2
27.30 (max)	37.5

RMS % Error	Life Prediction Ratio Summary
20.55	0. .5 .8 1.25 2.

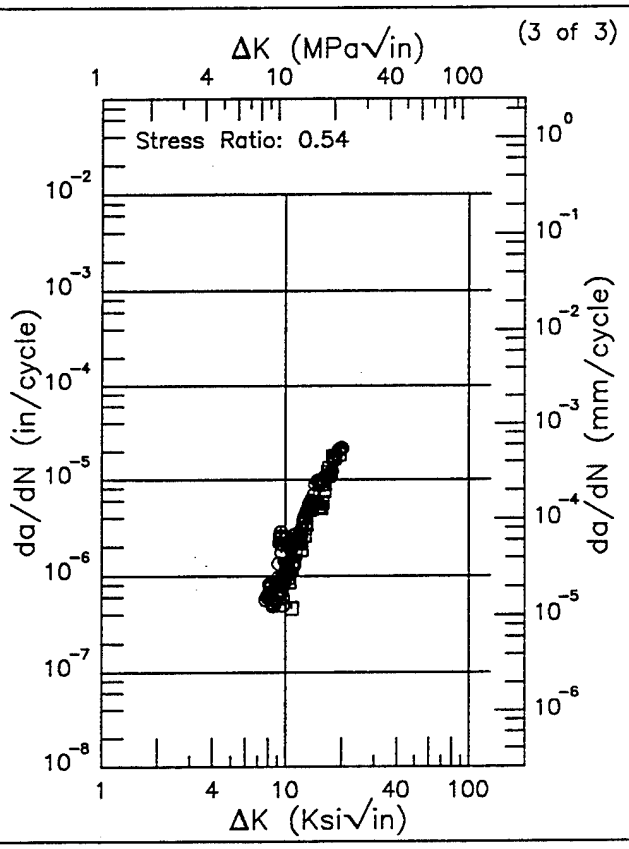
RMS % Error	Life Prediction Ratio Summary
26.73	0. .5 .8 1.25 2.

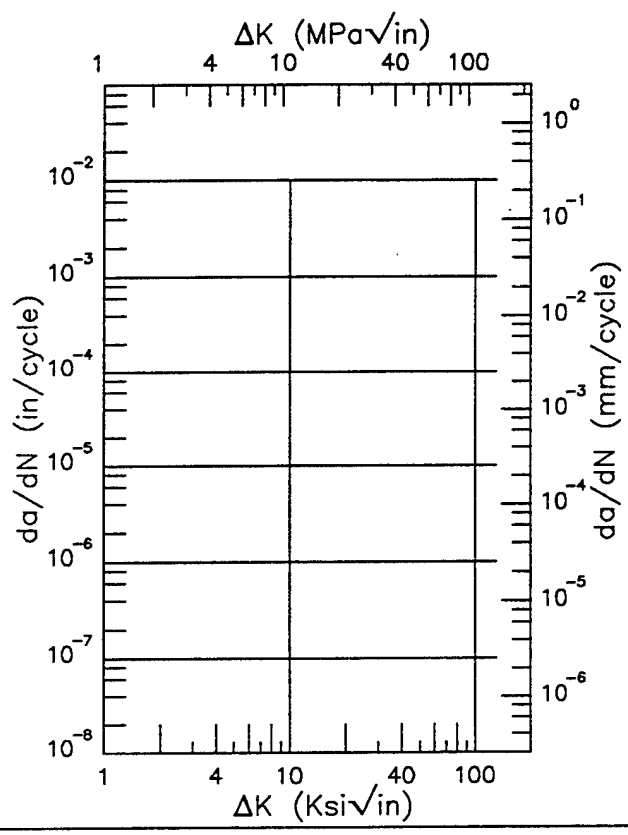
Figure 6.16.3.1.95

Ti–6Al–4V R

Condition/Ht: MA 1300F 2HRS AC
Form: 1.75 in. Disk
Specimen Type: KB Bar
Orientation: L–R
Frequency: 0.3 Hz
Environment: LAB AIR;300°F

Yield Strength: 120 ksi
Ult. Strength:
Specimen Thk: 0.244 – 0.25 in.
Specimen Width: 1 – 1.005 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.74 (min)	0.526
8.	0.612
9.	0.868
10.	1.12
13.	4.23
16.	8.63
19.93 (max)	20.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
43.65	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

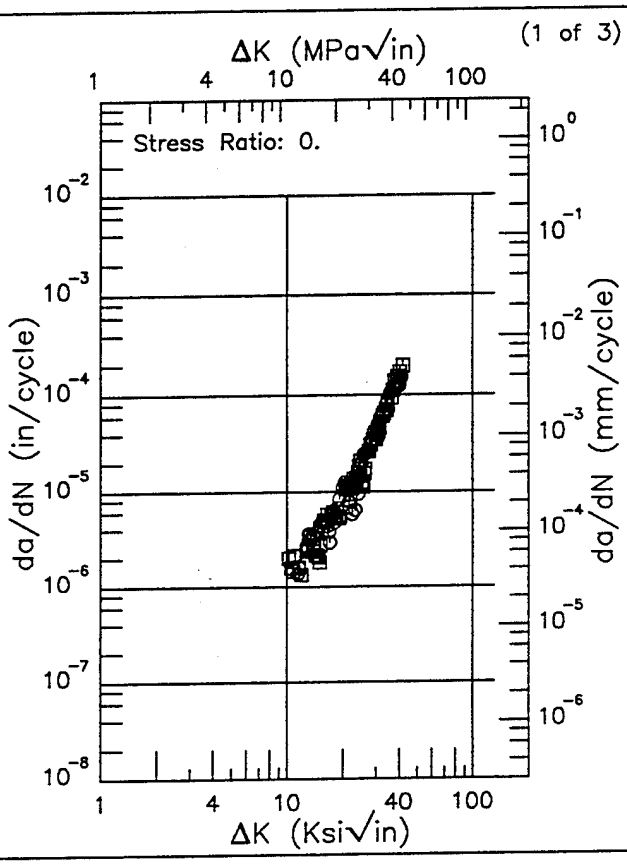
Figure 6.16.3.1.95 (Concluded)

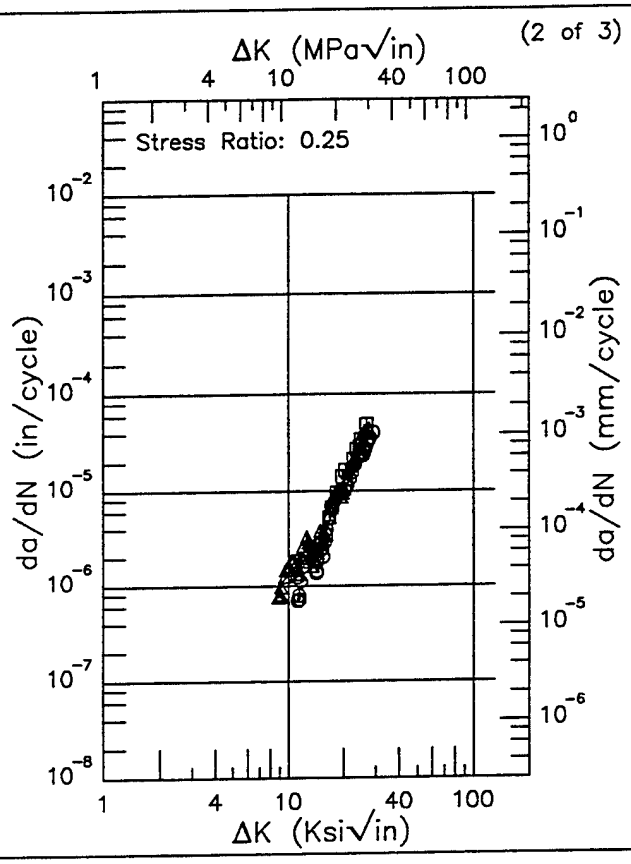
R

Ti–6Al–4V

Condition/Ht: MA 1300F 2HRS AC
Form:
Specimen Type: KB Bar
Orientation: L–R
Frequency: 0.3 Hz
Environment: LAB AIR;600°F

Yield Strength: 120 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.253 in.
Specimen Width: 0.995 – 1.003 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.19 (min)	1.59
13.	2.25
16.	4.13
20.	7.90
25.	16.2
30.	41.5
35.	89.4
40.	147.
41.78 (max)	176.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.78 (min)	0.898
9.	0.995
10.	1.37
13.	2.06
16.	3.76
20.	12.3
25.	27.9
28.82 (max)	43.4

RMS % Error	Life Prediction Ratio Summary
21.59	0. .5 .8 1.25 2.

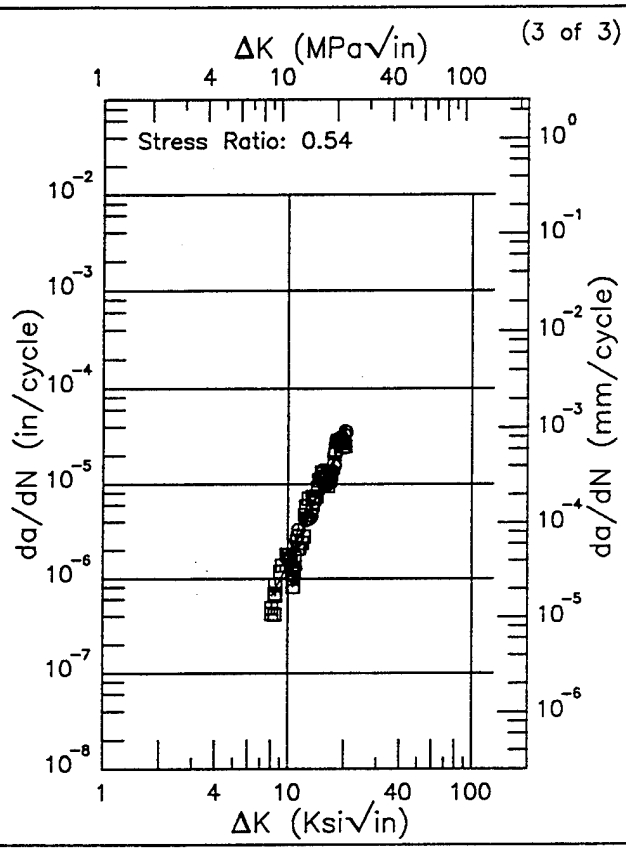
RMS % Error	Life Prediction Ratio Summary
22.81	0. .5 .8 1.25 2.

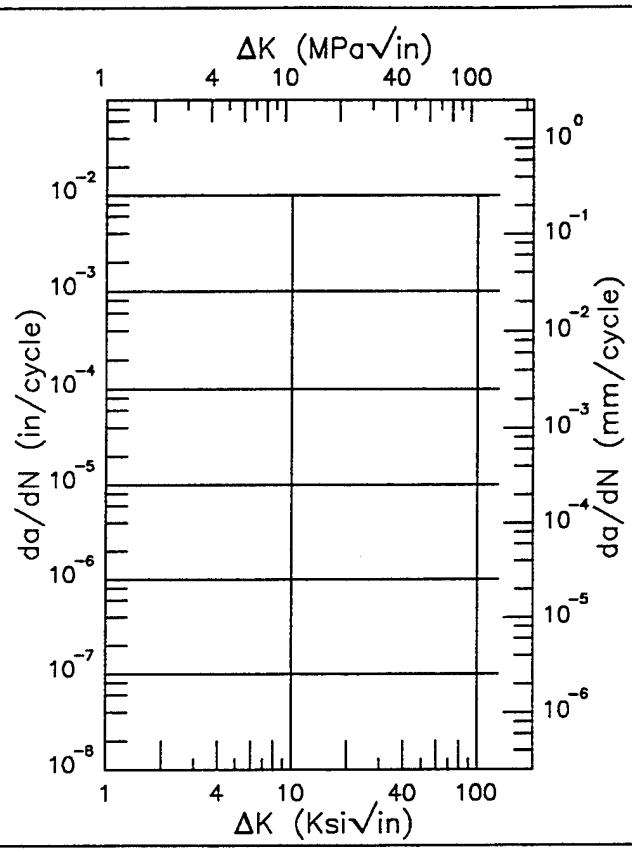
Figure 6.16.3.1.96

Ti–6Al–4V R

Condition/Ht: MA 1300F 2HRS AC
Form:
Specimen Type: KB Bar
Orientation: L–R
Frequency: 0.3 Hz
Environment: LAB AIR;600°F

Yield Strength: 120 ksi
Ult. Strength:
Specimen Thk: 0.249 – 0.253 in.
Specimen Width: 0.995 – 1.003 in.
Ref: GE007





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.13 (min)	0.658
9.	0.952
10.	1.46
13.	4.76
16.	12.4
20.	31.1
20.36 (max)	33.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 25.57

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

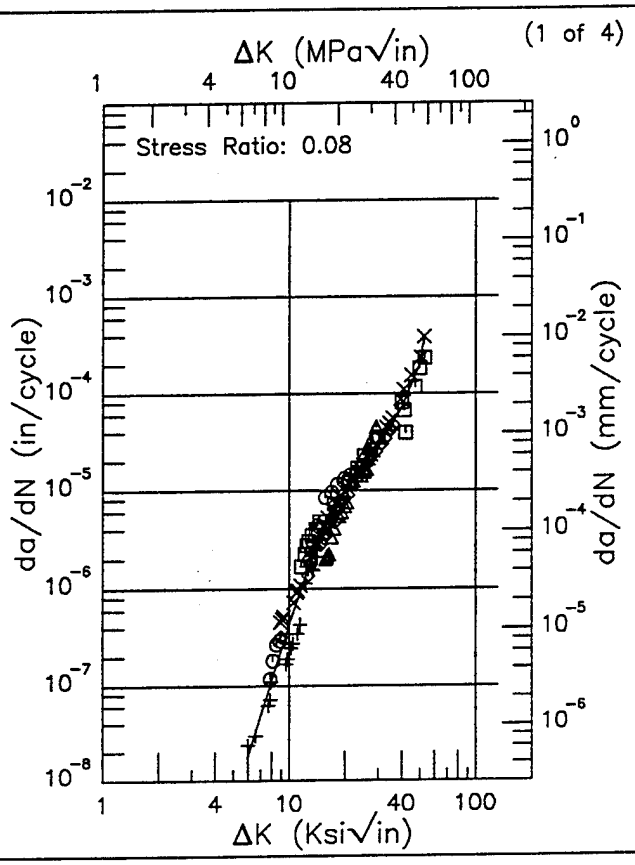
Figure 6.16.3.1.96 (Concluded)

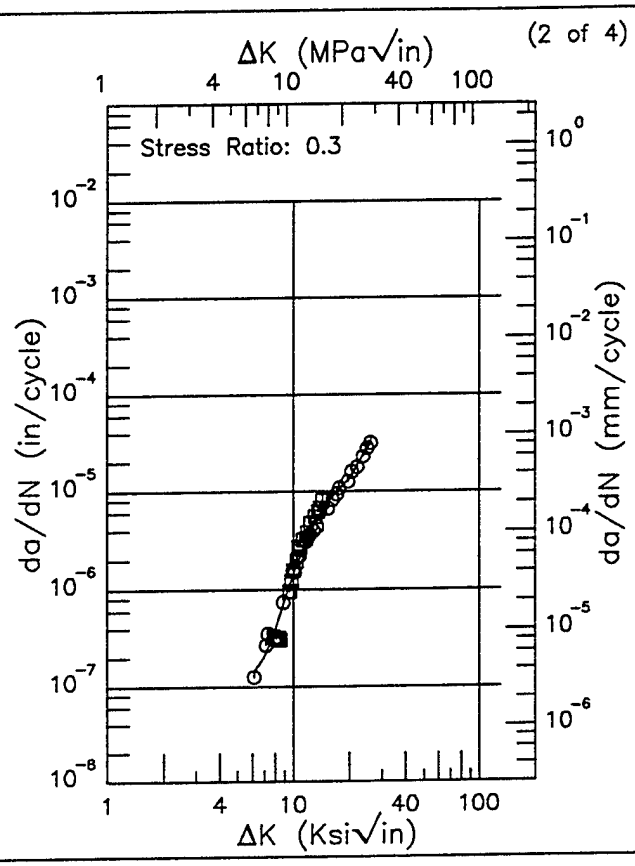
R

Ti–6Al–4V

Condition/Ht: RA
Form: 1.5 – 2 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 113 – 121 ksi
Ult. Strength: 127 – 135 ksi
Specimen Thk: 0.99 – 1 in.
Specimen Width: 7.4 – 7.41 in.
Ref: 88579;85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.98 (min)	0.0177
6.	0.0181
7.	0.0486
8.	0.113
9.	0.234
10.	0.437
13.	1.81
16.	4.64
20.	10.1
25.	18.4
30.	29.9
35.	47.4
40.	71.9
50.	204.
52.96 (max)	372.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.12 (min)	0.141
7.	0.205
8.	0.391
9.	0.778
10.	1.46
13.	4.92
16.	8.52
20.	13.3
25.	27.9
25.92 (max)	31.0

RMS % Error	Life Prediction Ratio Summary
36.17	△ + ⊙ ◇ ⊡ × — 0. .5 .8 1.25 2.

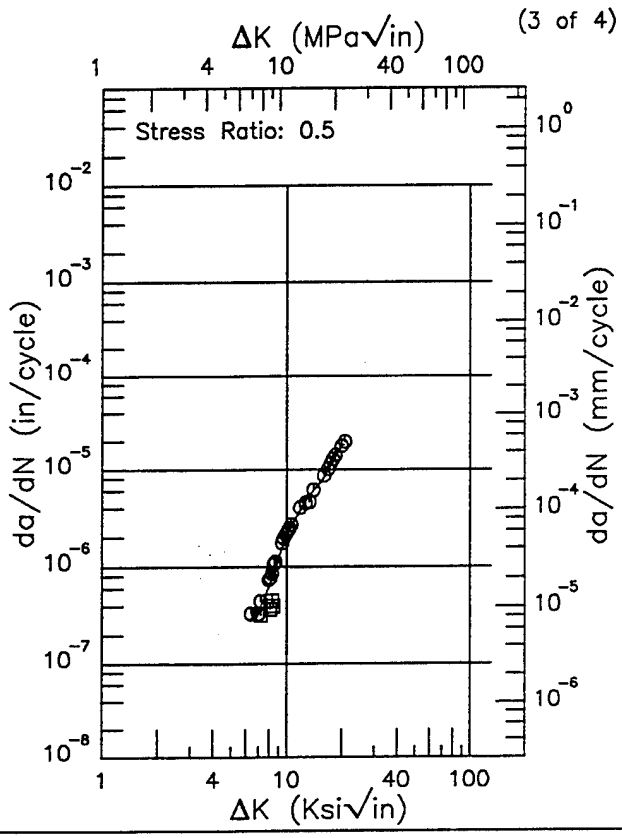
RMS % Error	Life Prediction Ratio Summary
17.77	⊡ ⊙ — 0. .5 .8 1.25 2.

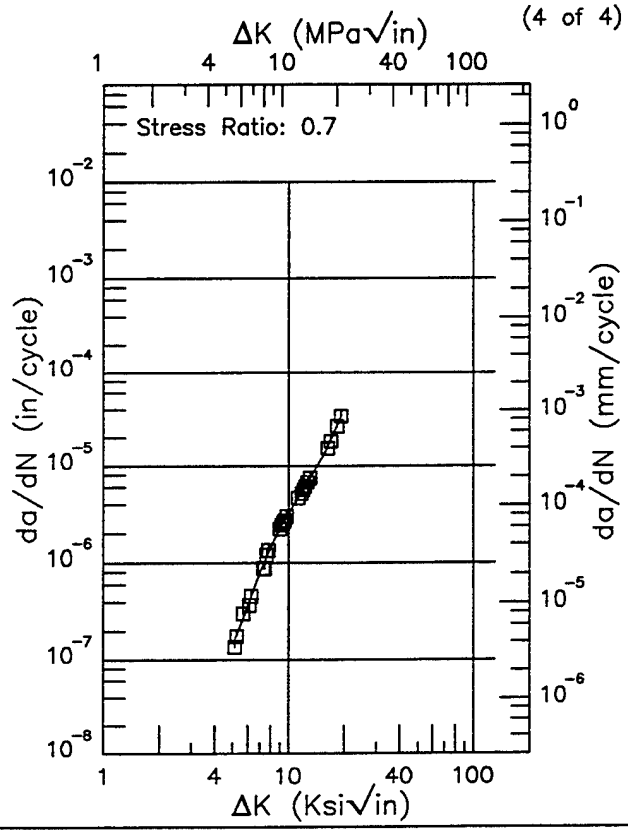
Figure 6.16.3.1.97

Ti–6Al–4V R

Condition/Ht: RA
Form: 1.5 – 2 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 113 – 121 ksi
Ult. Strength: 127 – 135 ksi
Specimen Thk: 0.99 – 1 in.
Specimen Width: 7.4 – 7.41 in.
Ref: 88579;85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.39 (min)	0.292
7.	0.353
8.	0.628
9.	1.21
10.	2.16
13.	5.09
16.	8.33
20.	18.1
20.65 (max)	18.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.11 (min)	0.159
6.	0.361
7.	0.775
8.	1.42
9.	2.25
10.	3.21
13.	7.23
16.	14.6
19.21 (max)	33.6

RMS % Error 18.14

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 5.80

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

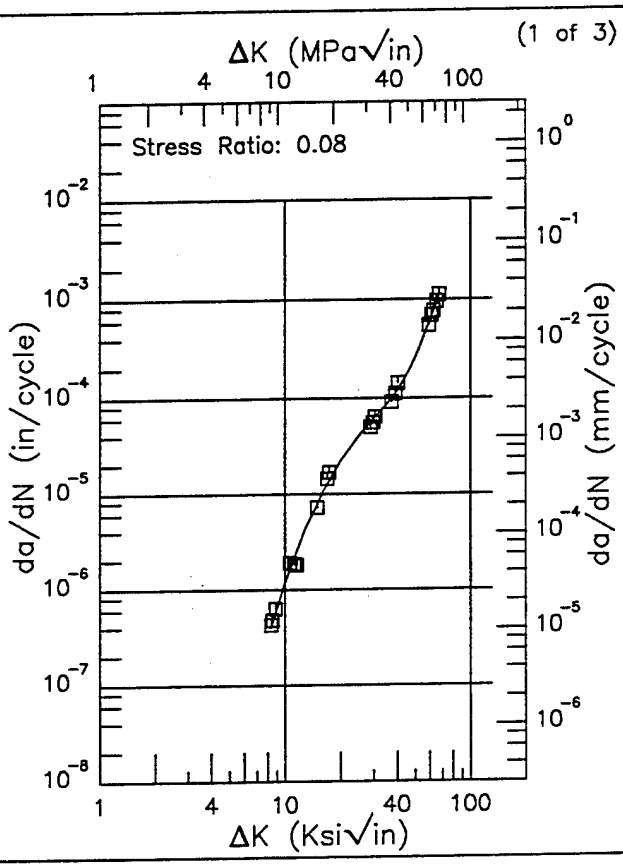
Figure 6.16.3.1.97 (Concluded)

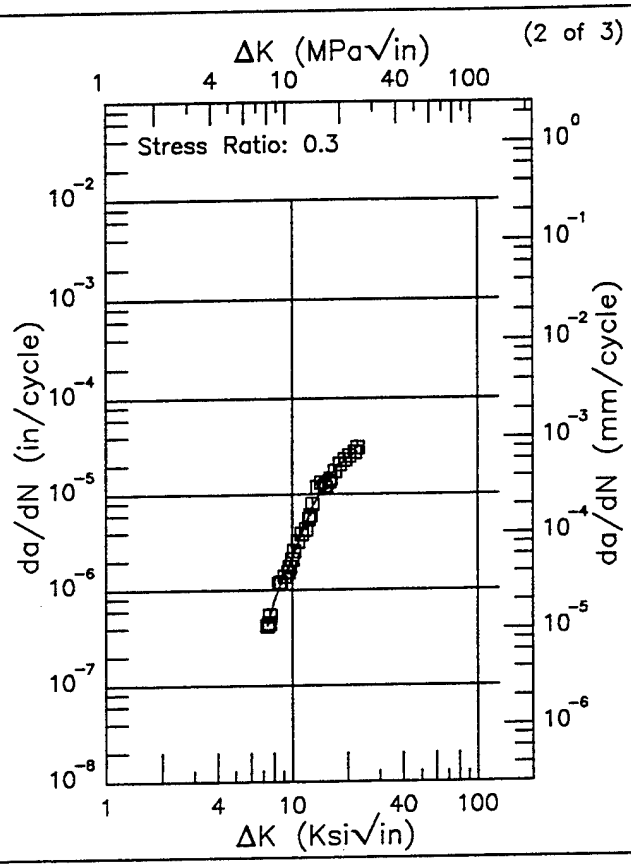
R

Ti–6Al–4V

Condition/Ht: RA
Form: 1.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 118 ksi
Ult. Strength: 129 ksi
Specimen Thk: 0.995 – 0.998 in.
Specimen Width: 7.4 in.
Ref: 85837



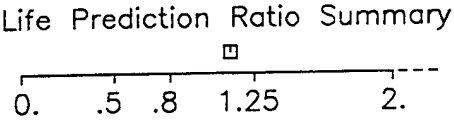


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.35 (min)	0.400
9.	0.642
10.	1.19
13.	4.49
16.	10.5
20.	22.4
25.	41.2
30.	62.1
35.	86.2
40.	119.
50.	255.
60.	602.
66.77 (max)	1055.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.37 (min)	0.434
8.	0.754
9.	1.39
10.	2.20
13.	7.72
16.	15.5
20.	24.1
22.54 (max)	27.8

RMS % Error 11.85

Life Prediction Ratio Summary



RMS % Error 10.05

Life Prediction Ratio Summary

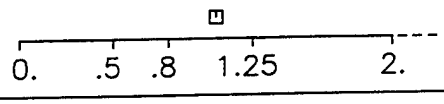
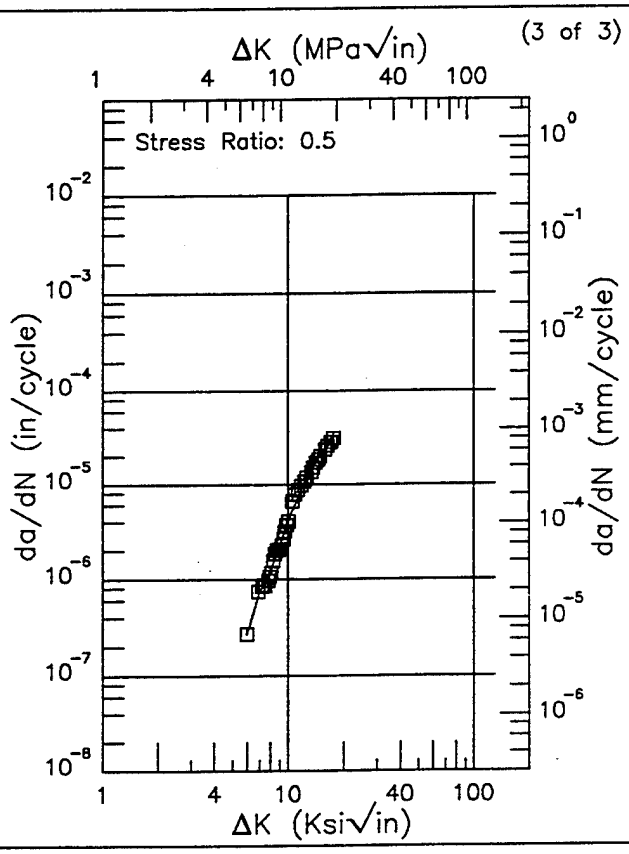


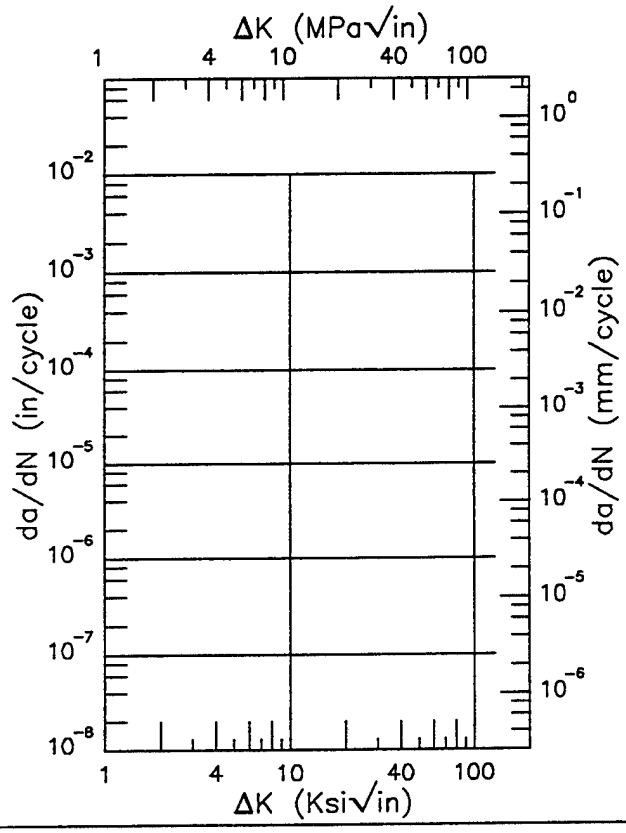
Figure 6.16.3.1.98

Ti–6Al–4V R

Condition/Ht: RA
Form: 1.5 in. Plate
Specimen Type: CT
Orientation: L–T
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 118 ksi
Ult. Strength: 129 ksi
Specimen Thk: 0.995 – 0.998 in.
Specimen Width: 7.4 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.97 (min)	0.272
6.	0.284
7.	0.731
8.	1.24
9.	2.14
10.	4.18
13.	13.6
16.	24.8
17.45 (max)	29.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
10.63	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

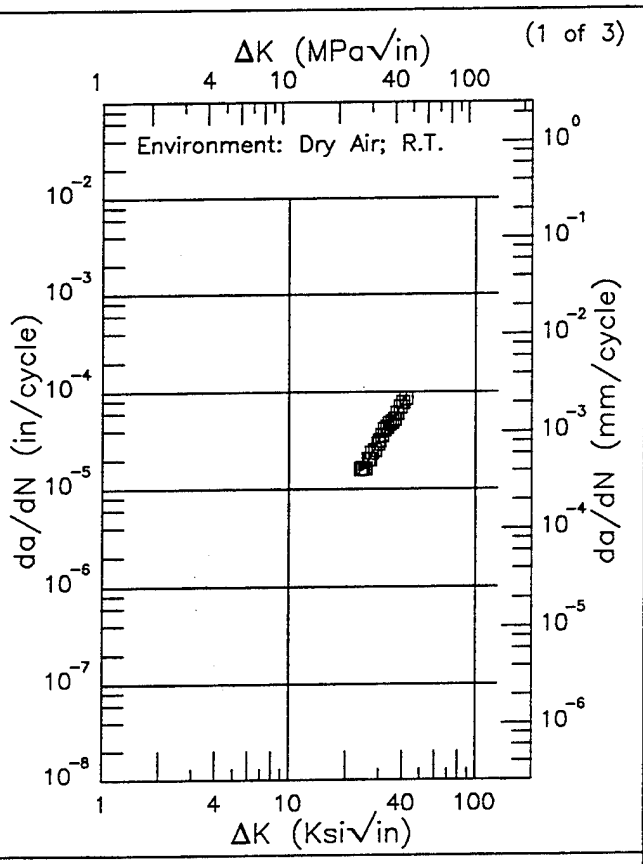
Figure 6.16.3.1.98 (Concluded)

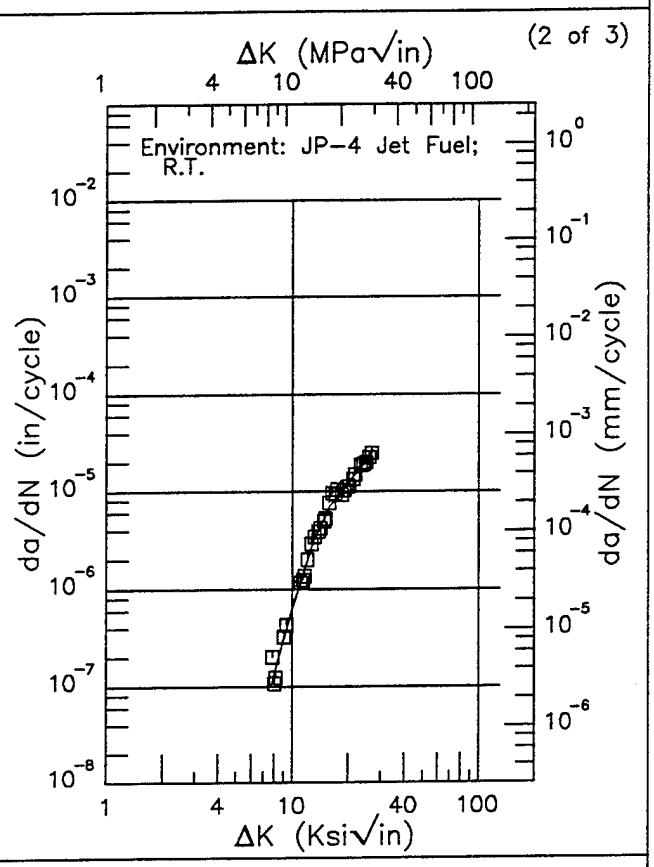
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1.5 – 2.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08
Frequency: 1 Hz

Yield Strength: 118 – 124 ksi
Ult. Strength: 129 – 138 ksi
Specimen Thk: 0.99 – 1 in.
Specimen Width: 7.4 in.
Ref: 85837;88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
24.00 (min)	15.5
25.	16.5
30.	31.7
35.	49.2
40.	75.1
41.69 (max)	86.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.83 (min)	0.111
8.	0.130
9.	0.306
10.	0.637
13.	3.06
16.	7.07
20.	12.4
25.	20.4
26.71 (max)	25.2

RMS % Error	Life Prediction Ratio Summary
3.31	0. .5 .8 1.25 2.

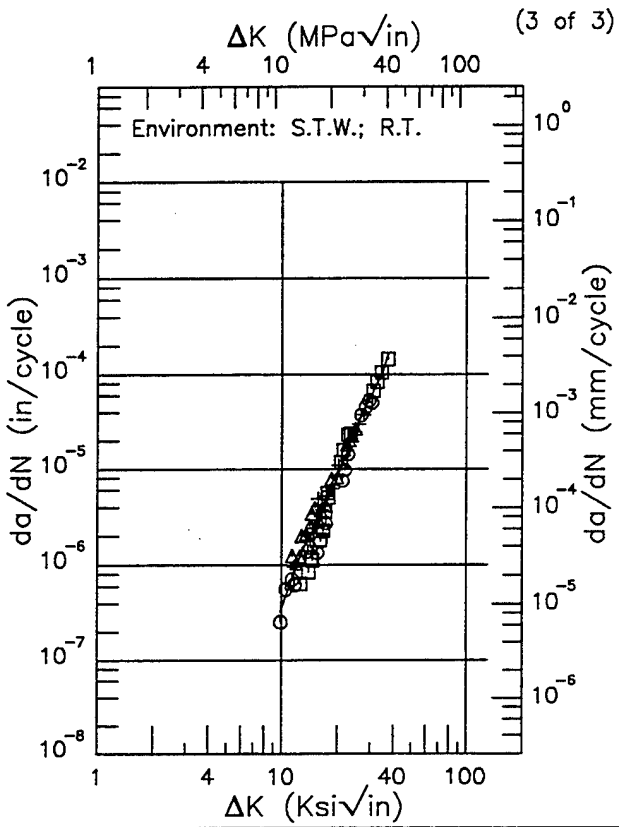
RMS % Error	Life Prediction Ratio Summary
17.85	0. .5 .8 1.25 2.

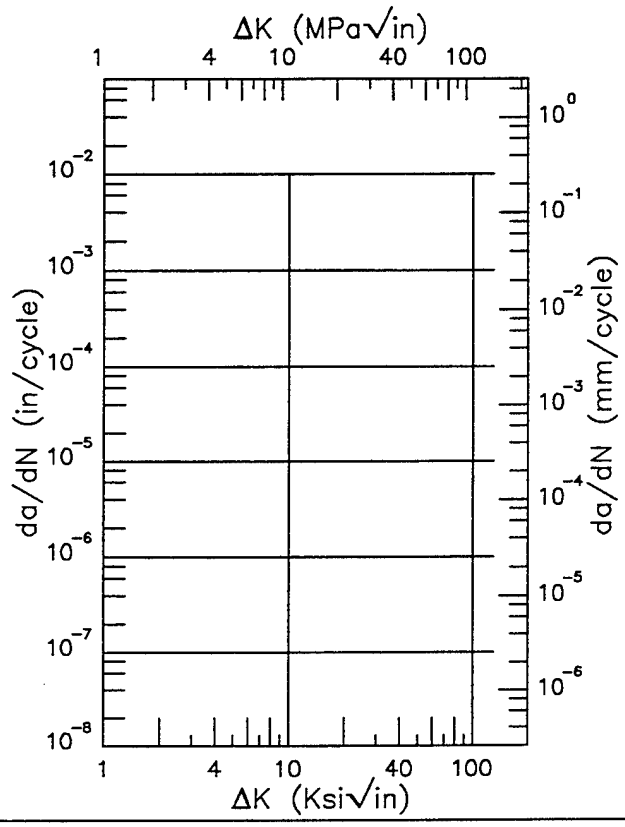
Figure 6.16.3.1.99

Ti–6Al–4V E

Condition/Ht: RA
Form: 1.5 – 2.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08
Frequency: 1 Hz

Yield Strength: 118 – 124 ksi
Ult. Strength: 129 – 138 ksi
Specimen Thk: 0.99 – 1 in.
Specimen Width: 7.39 – 7.4 in.
Ref: 85837;88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.87 (min)	0.328
10.	0.359
13.	1.40
16.	3.08
20.	8.22
25.	27.1
30.	57.3
35.	106.
37.05 (max)	153.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
29.82	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

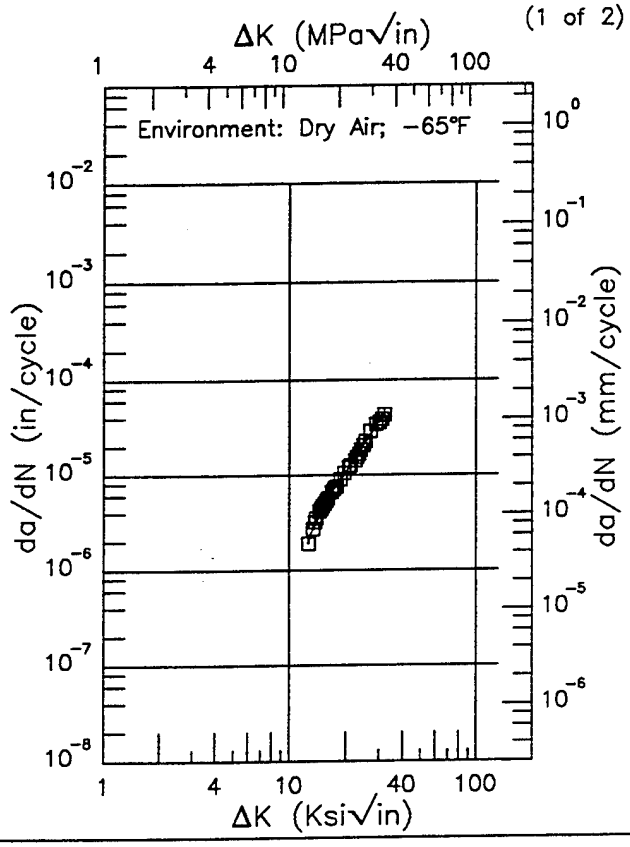
Figure 6.16.3.1.99 (Concluded)

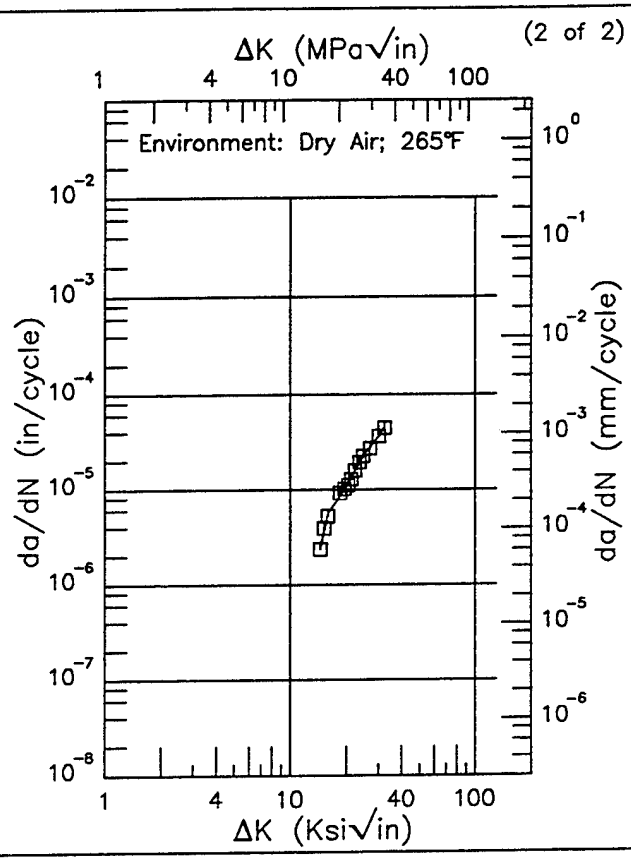
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1.5 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08
Frequency: 6 Hz

Yield Strength: 118 – 121 ksi
Ult. Strength: 129 – 134 ksi
Specimen Thk: 0.99 – 0.997 in.
Specimen Width: 5 – 7.4 in.
Ref: 85837;88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.57 (min)	1.93
13.	2.37
16.	5.81
20.	10.5
25.	21.4
30.	36.8
31.93 (max)	40.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.47 (min)	2.44
16.	5.63
20.	10.8
25.	23.1
30.	35.8
32.07 (max)	44.6

RMS % Error	Life Prediction Ratio Summary
4.97	0. .5 .8 1.25 2.

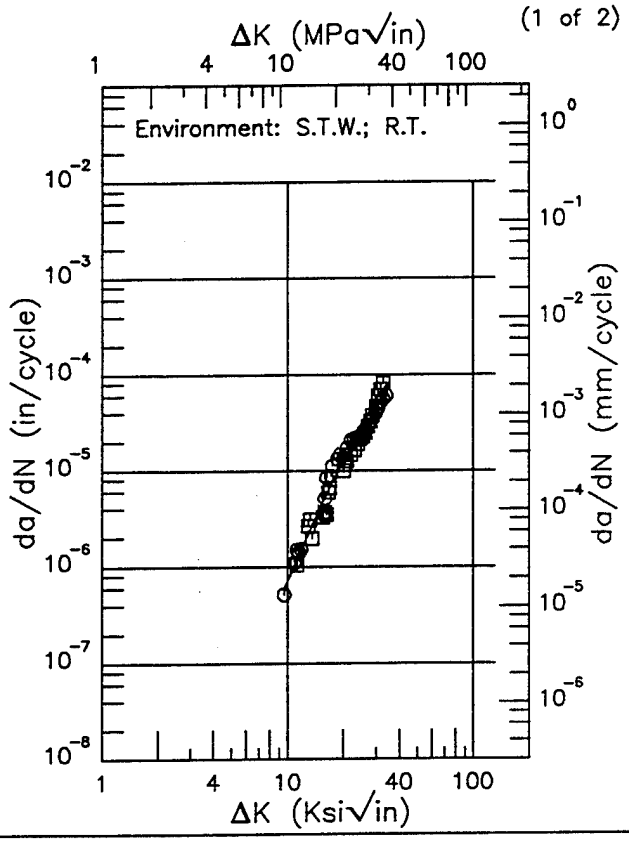
RMS % Error	Life Prediction Ratio Summary
4.42	0. .5 .8 1.25 2.

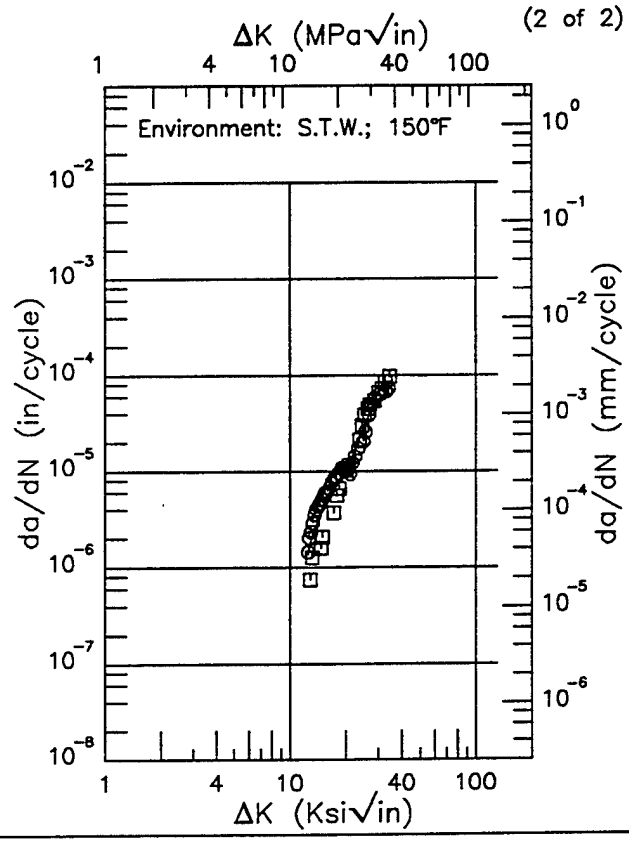
Figure 6.16.3.1.100

Ti–6Al–4V E

Condition/Ht: RA
Form: 1.5 – 2 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08
Frequency: 0.1 – 1 Hz

Yield Strength: 117 – 122 ksi
Ult. Strength: 133 – 135 ksi
Specimen Thk: 0.988 – 1.01 in.
Specimen Width: 7.39 – 7.4 in.
Ref: 88579;85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.52 (min)	0.585
10.	0.707
13.	2.18
16.	5.44
20.	12.9
25.	24.3
30.	43.0
33.81 (max)	76.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.49 (min)	1.35
13.	1.93
16.	5.61
20.	9.73
25.	28.1
30.	66.3
34.28 (max)	85.2

RMS % Error	Life Prediction Ratio Summary
20.11	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
26.14	0. .5 .8 1.25 2.

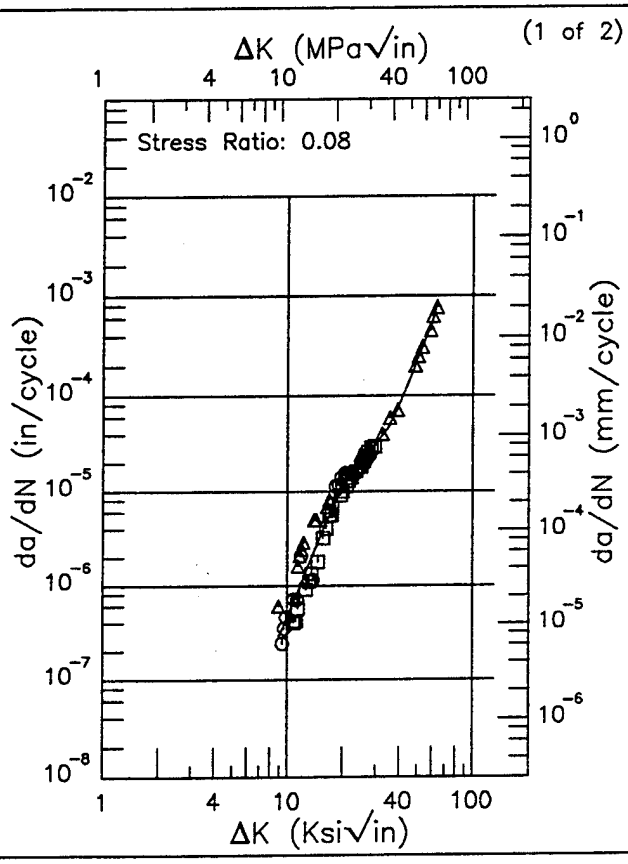
Figure 6.16.3.1.101

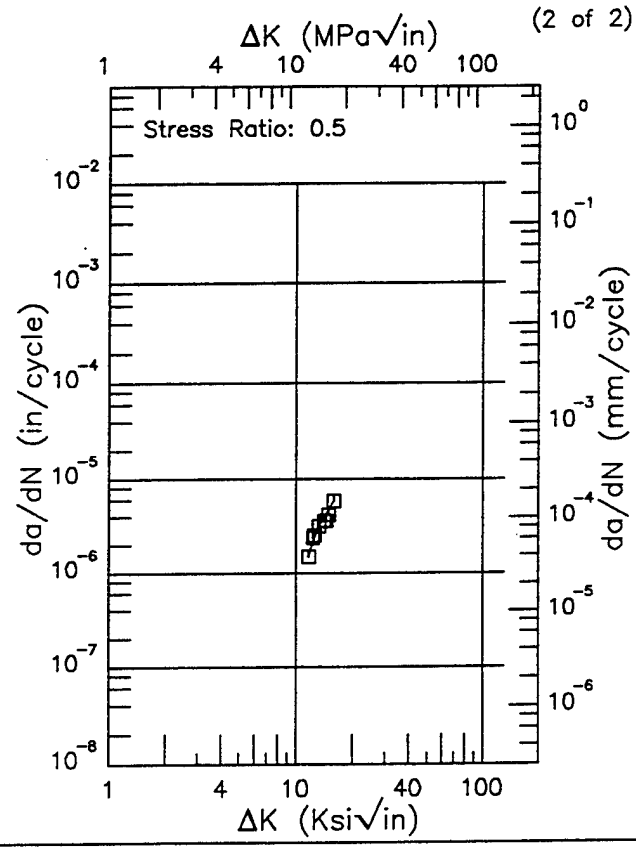
Ti–6Al–4V

R

Condition/Ht: RA
Form: 1.5 – 2.5 in. Plate
Specimen Type: CT
Orientation: T–L
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 121 – 122 ksi
Ult. Strength: 134 – 135 ksi
Specimen Thk: 0.99 – 1.013 in.
Specimen Width: 7.38 – 7.4 in.
Ref: 88579;85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.94 (min)	0.287
9.	0.295
10.	0.457
13.	1.60
16.	4.40
20.	11.3
25.	21.6
30.	31.8
35.	48.2
40.	82.1
50.	233.
60.	544.
63.39 (max)	785.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.70 (min)	1.48
13.	2.99
15.81 (max)	5.78

RMS % Error	Life Prediction Ratio Summary
44.61	0. .5 .8 1.25 2.

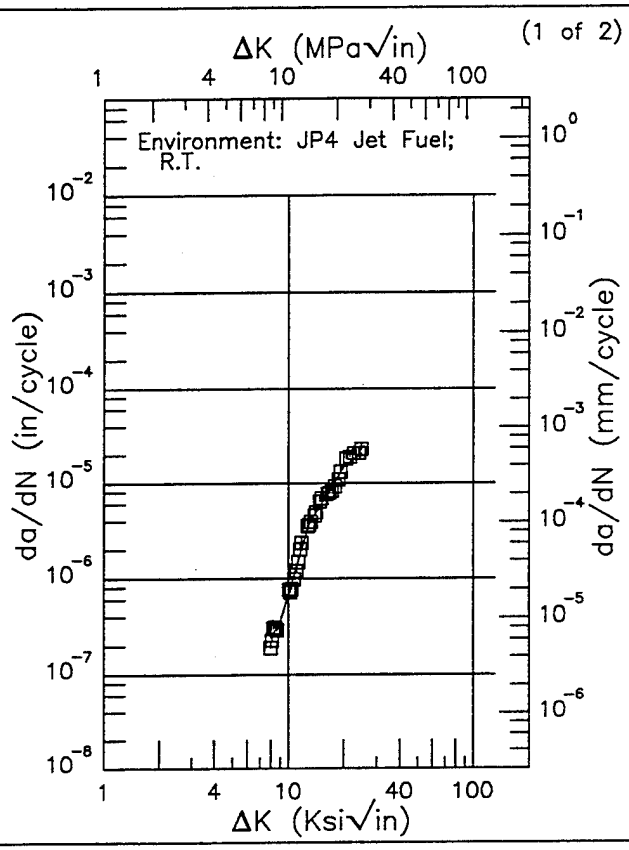
RMS % Error	Life Prediction Ratio Summary
10.53	0. .5 .8 1.25 2.

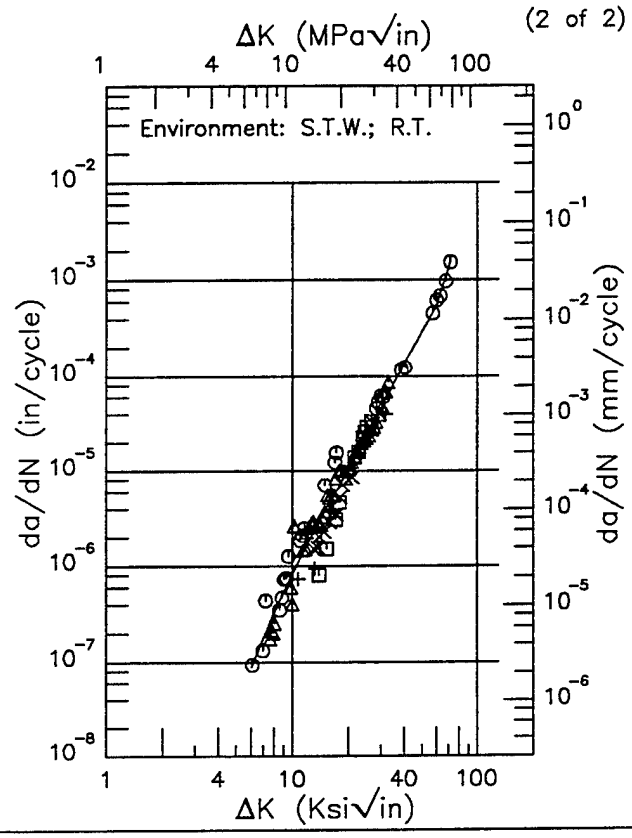
Figure 6.16.3.1.102

Ti–6Al–4V E

Condition/Ht: RA
Form: 1.5 – 2.5 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08
Frequency: 1 Hz

Yield Strength: 122 – 126 ksi
Ult. Strength: 134 – 135 ksi
Specimen Thk: 0.994 – 1 in.
Specimen Width: 7.4 in.
Ref: 85837;88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.99 (min)	0.244
8.	0.245
9.	0.356
10.	0.692
13.	3.76
16.	7.32
20.	14.9
24.76 (max)	20.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.08 (min)	0.0881
7.	0.177
8.	0.326
9.	0.541
10.	0.832
13.	2.26
16.	4.77
20.	10.5
25.	23.2
30.	45.9
35.	83.0
40.	137.
50.	295.
60.	552.
70.	1325.
71.06 (max)	1488.

RMS % Error	Life Prediction Ratio Summary
10.46	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
41.07	0. .5 .8 1.25 2.

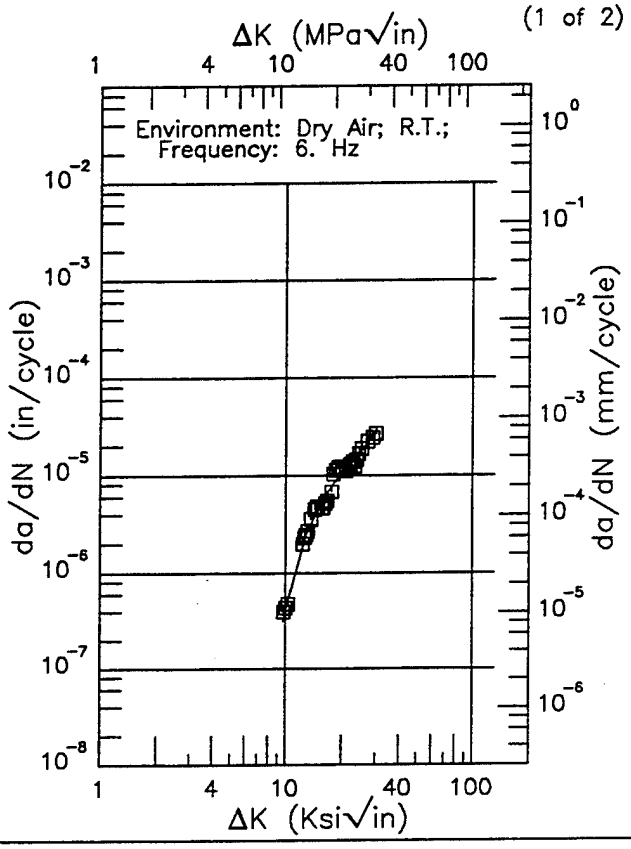
Figure 6.16.3.1.103

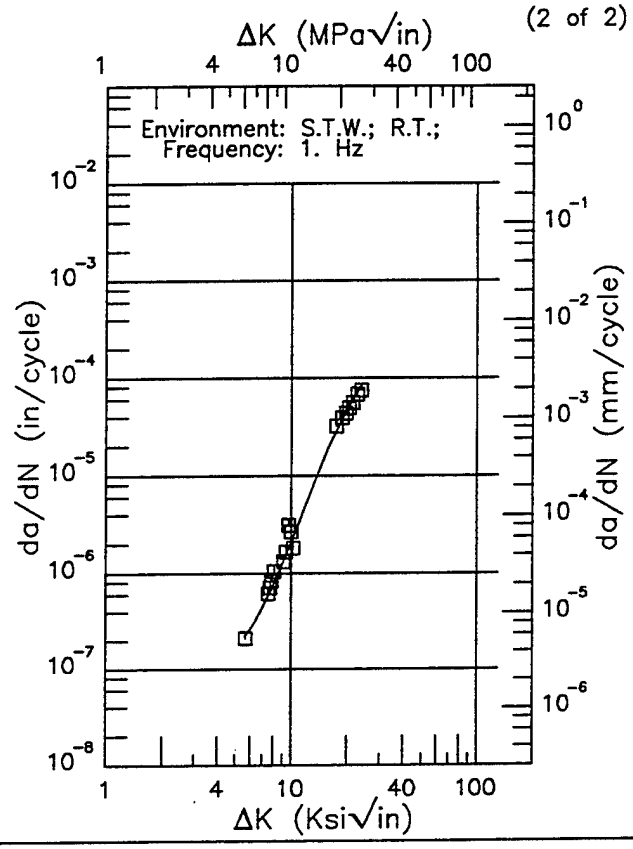
EF

Ti–6Al–4V

Condition/Ht: RA
Form: 0.38 – 1.5 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08

Yield Strength: 125 – 129 ksi
Ult. Strength: 135 – 140 ksi
Specimen Thk: 0.41 – 0.501 in.
Specimen Width: 7.4 in.
Ref: 85837;88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.68 (min)	0.315
10.	0.425
13.	2.58
16.	6.03
20.	10.8
25.	17.2
29.94 (max)	27.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.67 (min)	0.225
6.	0.262
7.	0.437
8.	0.747
9.	1.26
10.	2.08
13.	7.51
16.	19.9
20.	48.7
23.65 (max)	81.2

RMS % Error 14.04

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 23.04

Life Prediction Ratio Summary

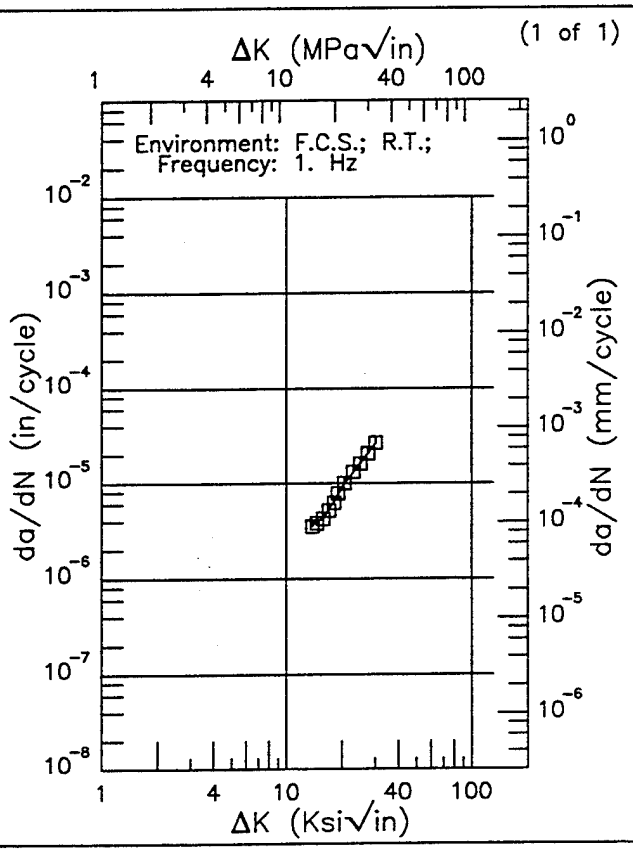
0. .5 .8 1.25 2.

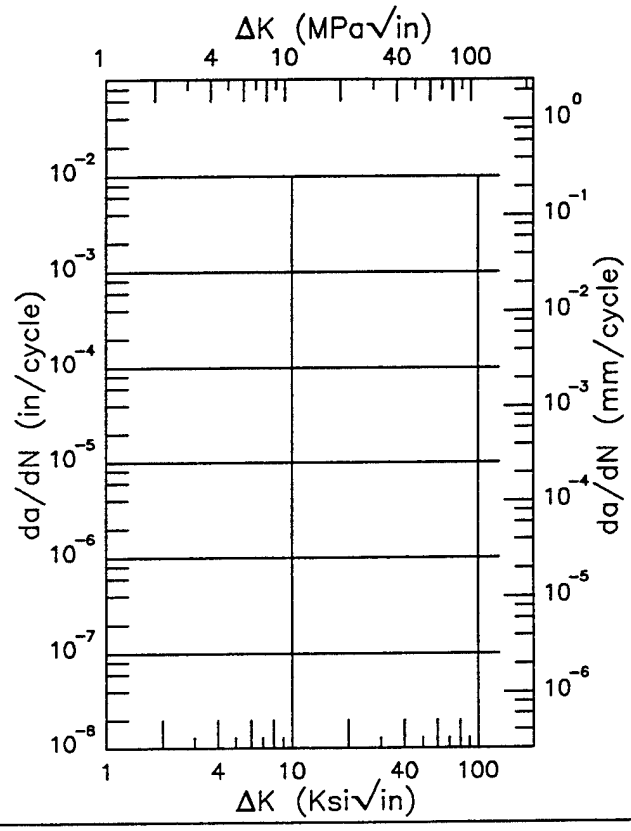
Figure 6.16.3.1.104

Ti–6Al–4V EF

Condition/Ht: RA
Form: 1.5 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.08

Yield Strength: 117 ksi
Ult. Strength: 133 ksi
Specimen Thk: 1.38 in.
Specimen Width: 4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.81 (min)	3.62
16.	4.34
20.	9.10
25.	16.4
30.	25.8
30.21 (max)	26.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
2.42	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

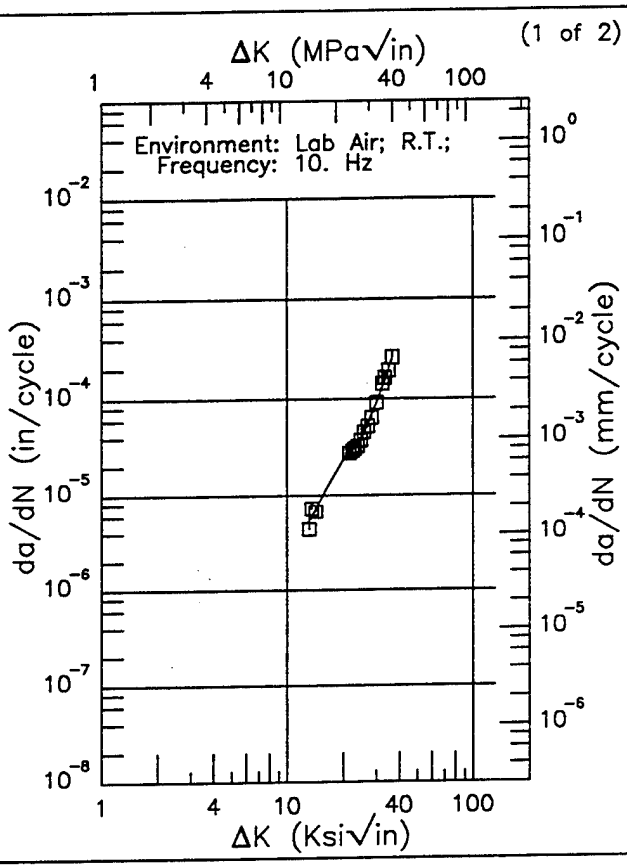
Figure 6.16.3.1.105

EF Ti–6Al–4V

Condition/Ht: RA
Form: 0.38 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1

Yield Strength: 141.7 – 149.2 ksi
Ult. Strength: 151.8 – 156.2 ksi
Specimen Thk: 0.372 – 0.375 in.
Specimen Width: 2.549 – 2.55 in.
Ref: 90981

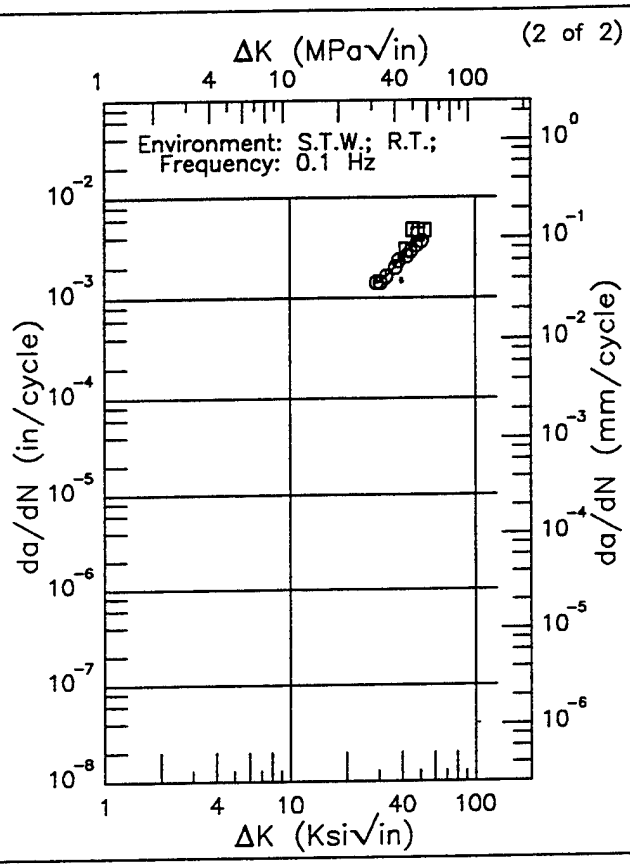
(1 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.05 (min)	5.31
16.	11.3
20.	23.5
25.	39.0
30.	90.6
35.	204.
36.63 (max)	253.

RMS % Error	Life Prediction Ratio Summary
7.37	0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
29.01 (min)	1405.
30.	1418.
35.	1800.
40.	2531.
50.	3951.
52.51 (max)	4043.

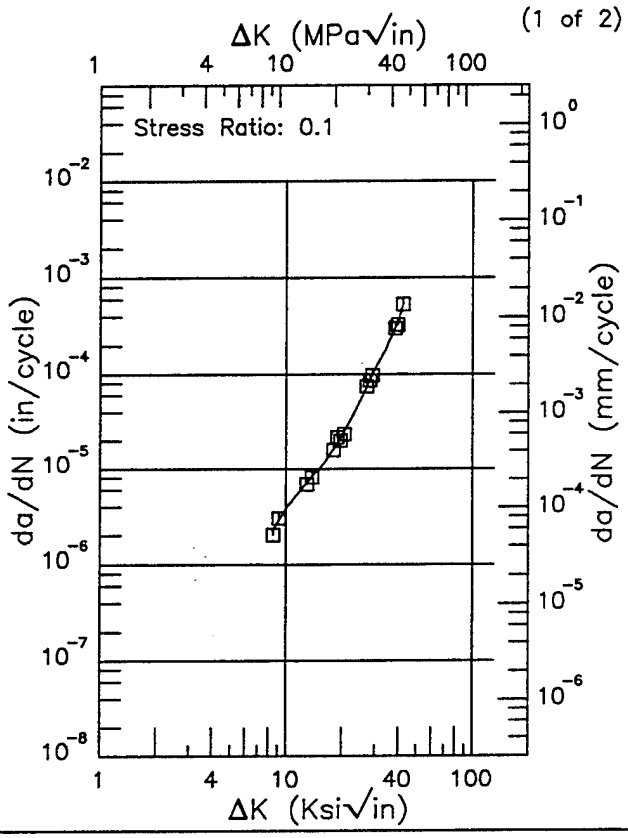
RMS % Error	Life Prediction Ratio Summary
14.17	0. .5 .8 1.25 2.

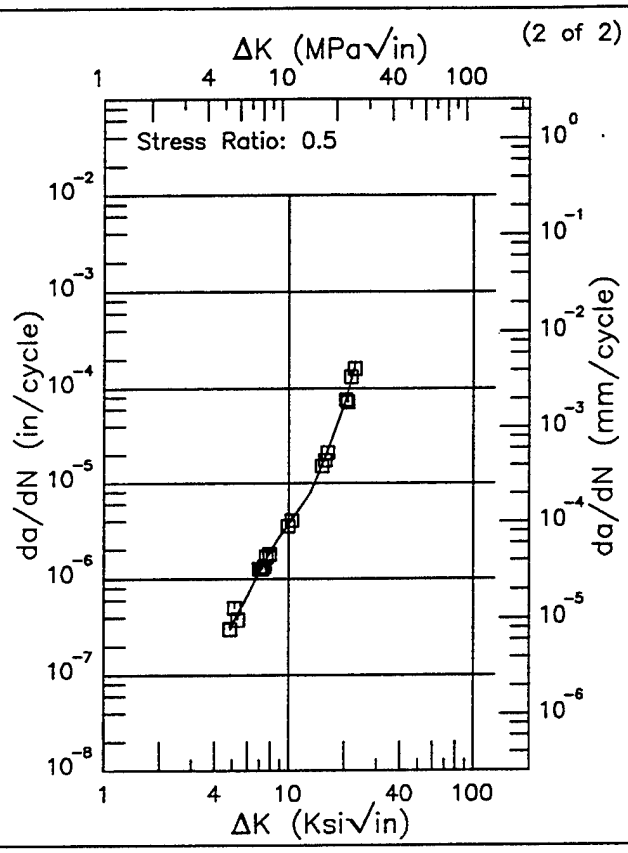
Figure 6.16.3.1.106

Ti–6Al–4V R

Condition/Ht: RA
Form: 0.13 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Frequency: 10 Hz
Environment: H.H.A.; RT

Yield Strength: 149.1 – 149.2 ksi
Ult. Strength: 156.2 ksi
Specimen Thk: 0.124 – 0.125 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.50 (min)	2.21
9.	2.75
10.	3.86
13.	7.21
16.	11.4
20.	22.1
25.	52.3
30.	115.
35.	207.
40.	365.
42.13 (max)	513.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.86 (min)	0.301
5.	0.335
6.	0.670
7.	1.19
8.	1.90
9.	2.74
10.	3.66
13.	7.71
16.	19.6
20.	65.8
22.81 (max)	171.

RMS % Error	Life Prediction Ratio Summary
6.15	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
12.10	0. .5 .8 1.25 2.

Figure 6.16.3.1.107

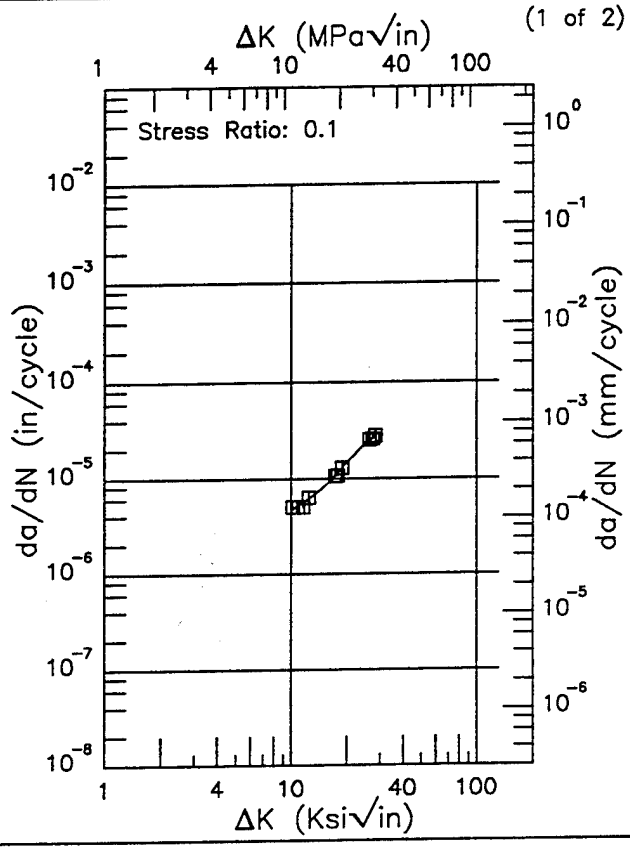
R

Ti–6Al–4V

Condition/Ht: RA
Form: 0.38 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Frequency: 10 Hz
Environment: H.H.A.; RT

Yield Strength: 141.7 ksi
Ult. Strength: 151.8 ksi
Specimen Thk: 0.37 – 0.371 in.
Specimen Width: 5 in.
Ref: 90981

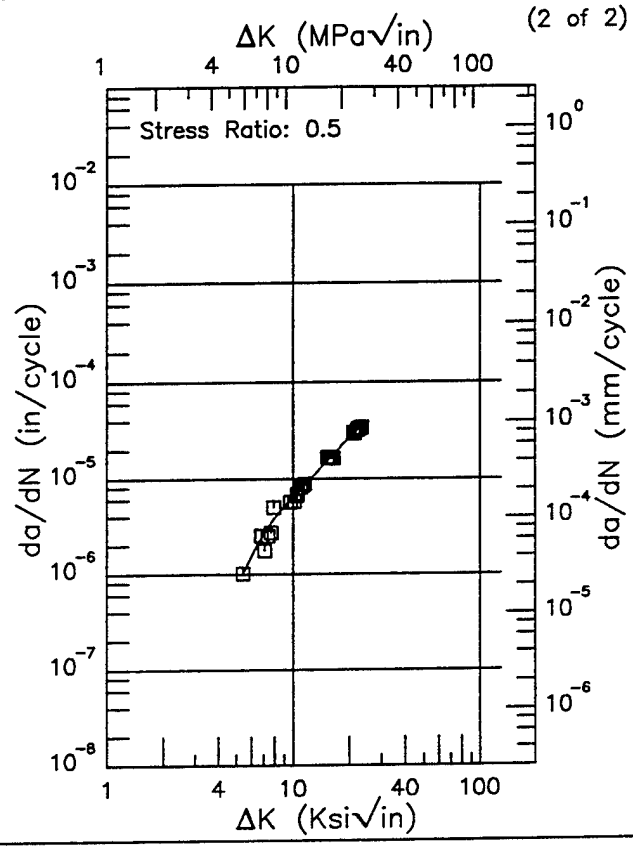
(1 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.10 (min)	4.73
13.	6.48
16.	9.13
20.	14.6
25.	23.4
28.25 (max)	27.1

RMS % Error	Life Prediction Ratio Summary
4.83	0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.41 (min)	0.990
6.	1.54
7.	2.64
8.	3.85
9.	5.11
10.	6.41
13.	10.9
16.	16.8
20.	26.6
23.27 (max)	34.9

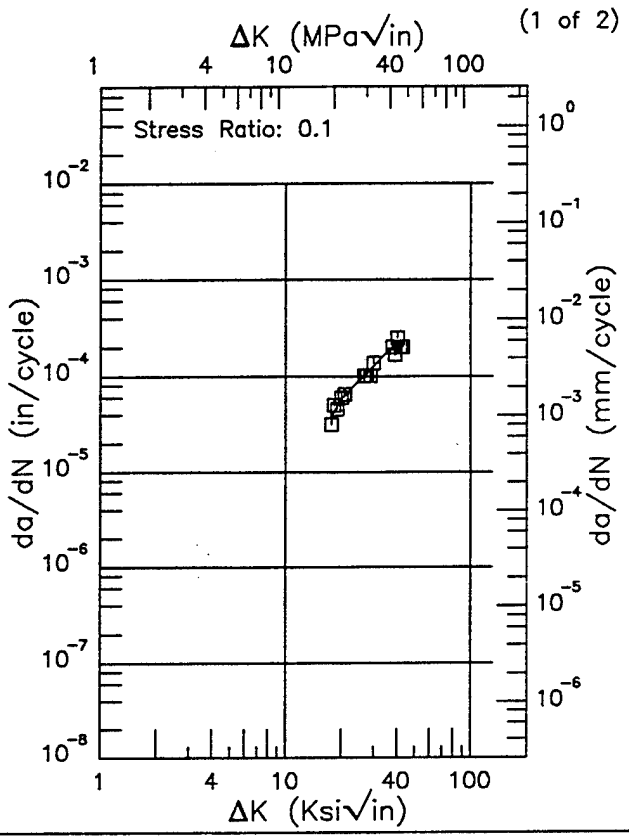
RMS % Error	Life Prediction Ratio Summary
12.82	0. .5 .8 1.25 2.

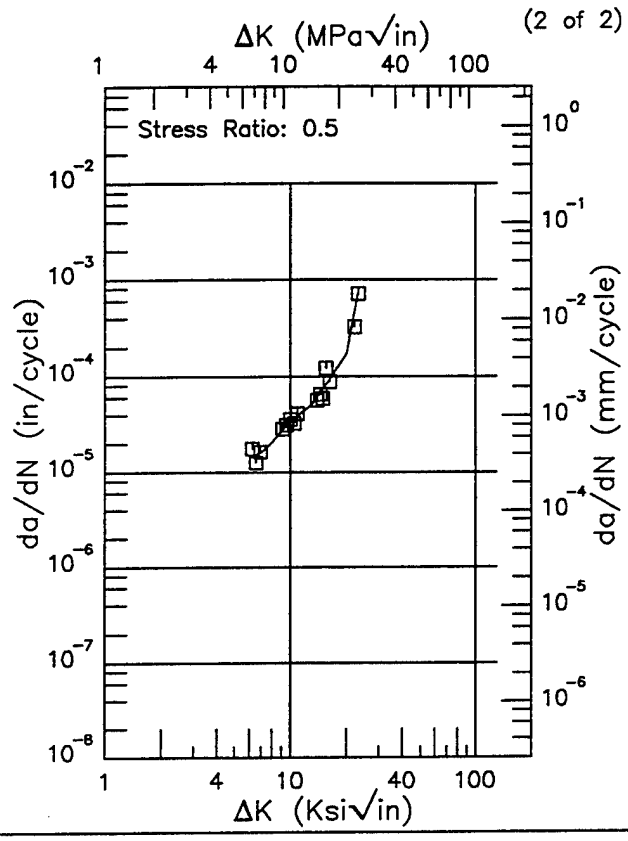
Figure 6.16.3.1.108

Ti–6Al–4V R

Condition/Ht: RA
Form: 0.38 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Frequency: 10 Hz
Environment: 3.5% NACL; RT

Yield Strength: 141.7 ksi
Ult. Strength: 151.8 ksi
Specimen Thk: 0.372 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.57 (min)	37.8
20.	57.5
25.	91.7
30.	128.
35.	177.
40.	208.
42.87 (max)	202.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.24 (min)	14.4
7.	16.1
8.	20.7
9.	27.2
10.	34.2
13.	51.0
16.	88.0
20.	171.
23.07 (max)	704.

RMS % Error	Life Prediction Ratio Summary
11.36	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
17.38	0. .5 .8 1.25 2.

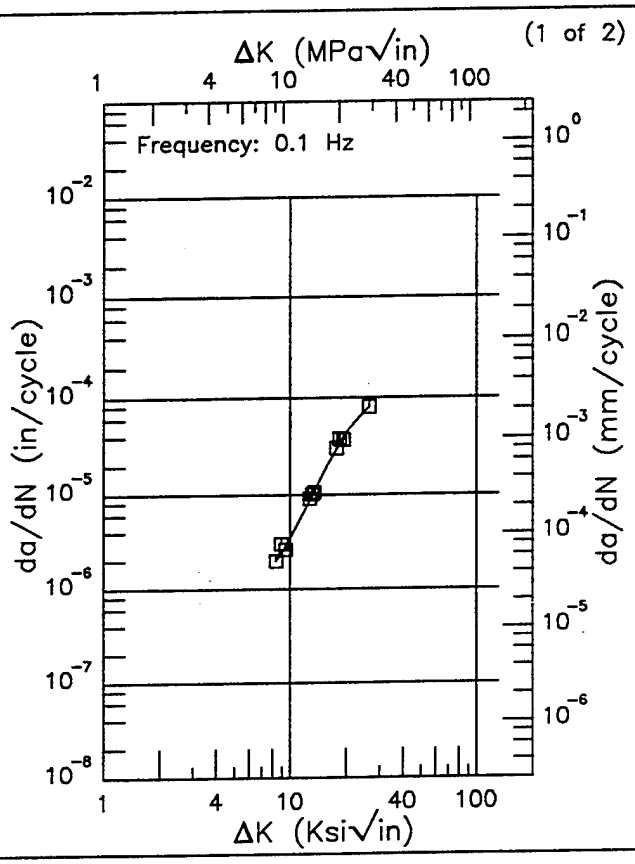
Figure 6.16.3.1.109

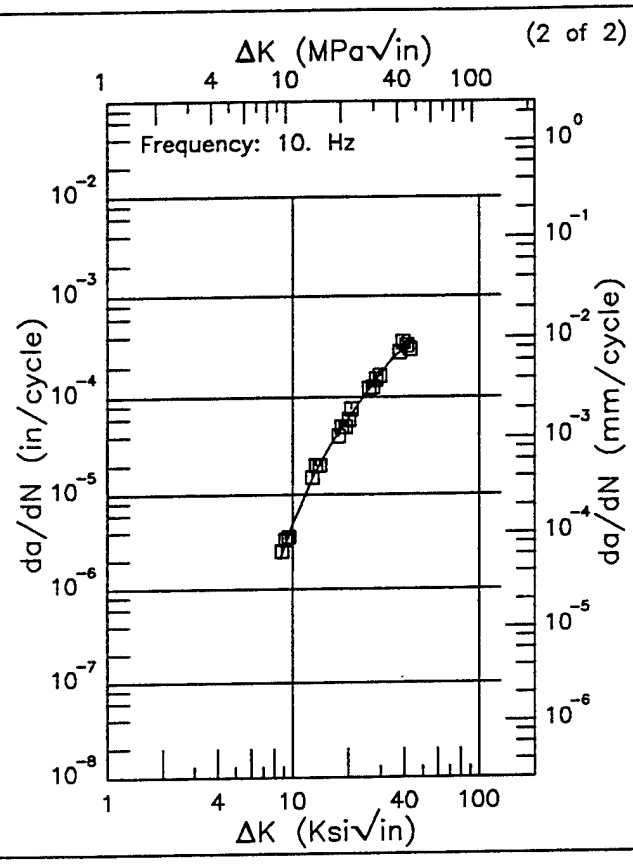
Ti–6Al–4V

F

Condition/Ht: RA
Form: 0.13 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Environment: 3.5% NACL; RT

Yield Strength: 149.2 ksi
Ult. Strength: 156.2 ksi
Specimen Thk: 0.125 in.
Specimen Width: 5 in.
Ref: 90981



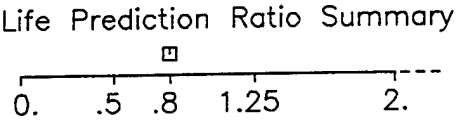


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.36 (min)	2.00
9.	2.47
10.	3.50
13.	9.45
16.	21.1
20.	44.7
25.	74.0
26.41 (max)	79.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.72 (min)	2.25
9.	2.73
10.	4.91
13.	15.9
16.	32.4
20.	61.3
25.	110.
30.	173.
35.	249.
40.	314.
42.50 (max)	332.

RMS % Error 9.49

Life Prediction Ratio Summary



RMS % Error 8.34

Life Prediction Ratio Summary

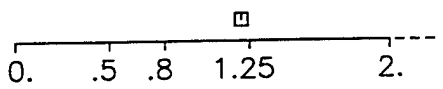


Figure 6.16.3.1.110

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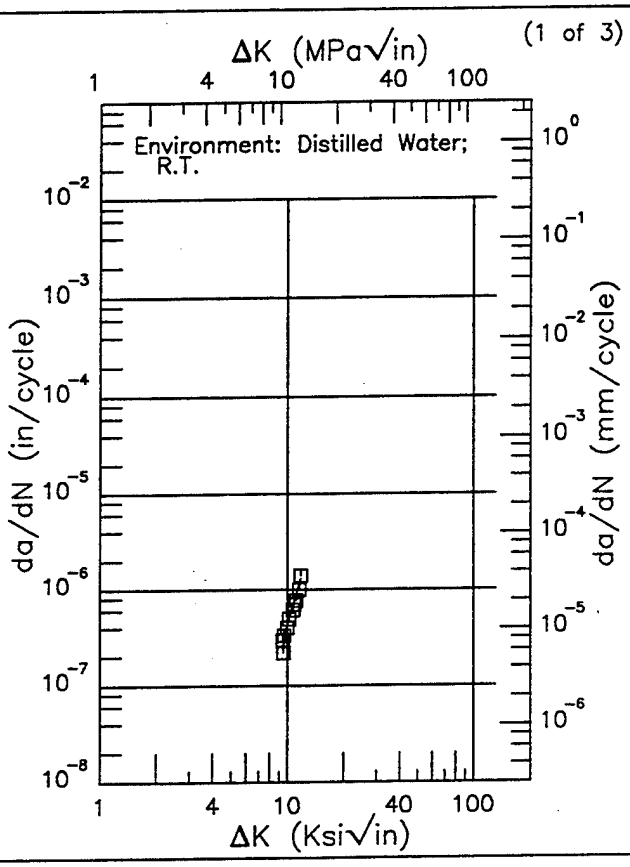
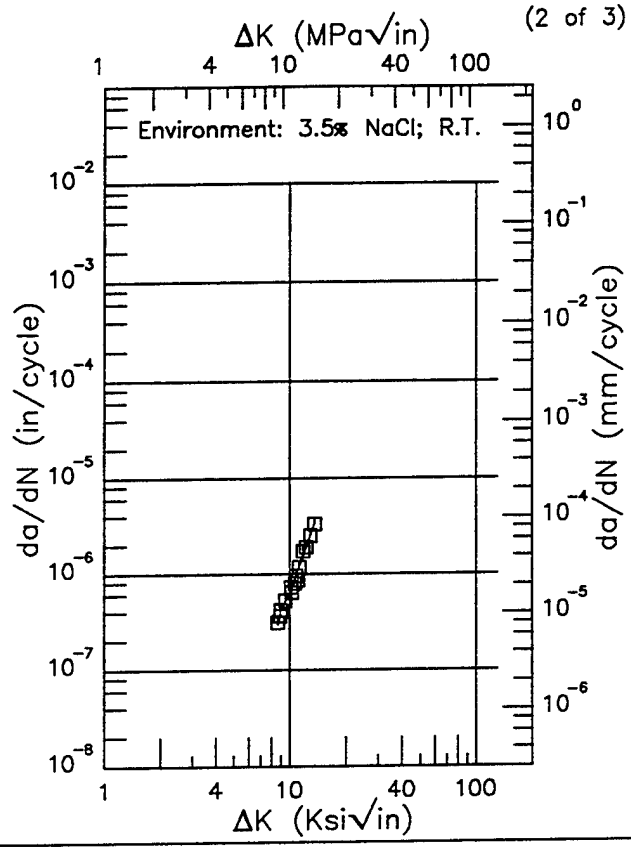
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.
Frequency: 15 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.44 (min)	0.241
10.	0.434
11.75 (max)	1.32

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.60 (min)	0.293
9.	0.430
10.	0.630
13.	2.63
13.55 (max)	3.24

RMS % Error	Life Prediction Ratio Summary
11.97	0. .5 .8 1.25 2.

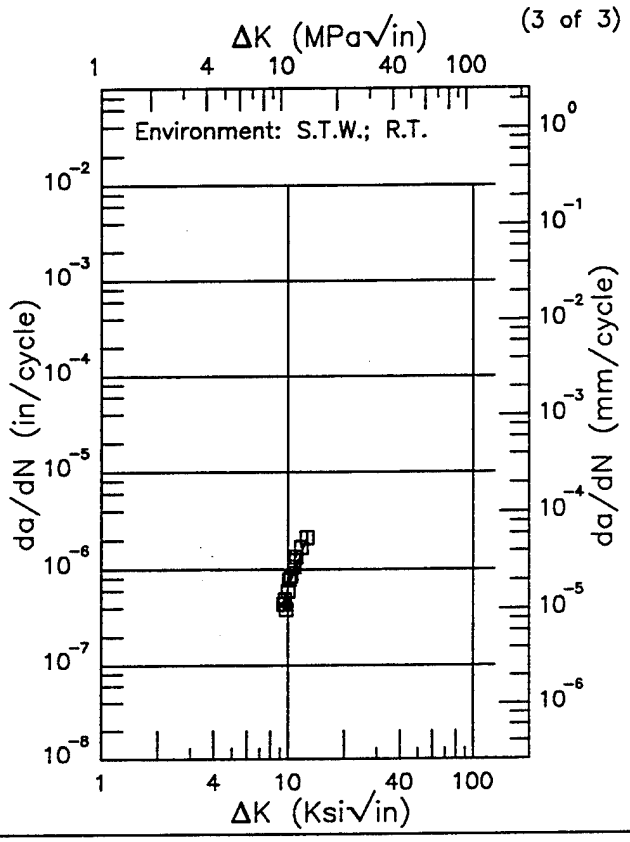
RMS % Error	Life Prediction Ratio Summary
8.71	0. .5 .8 1.25 2.

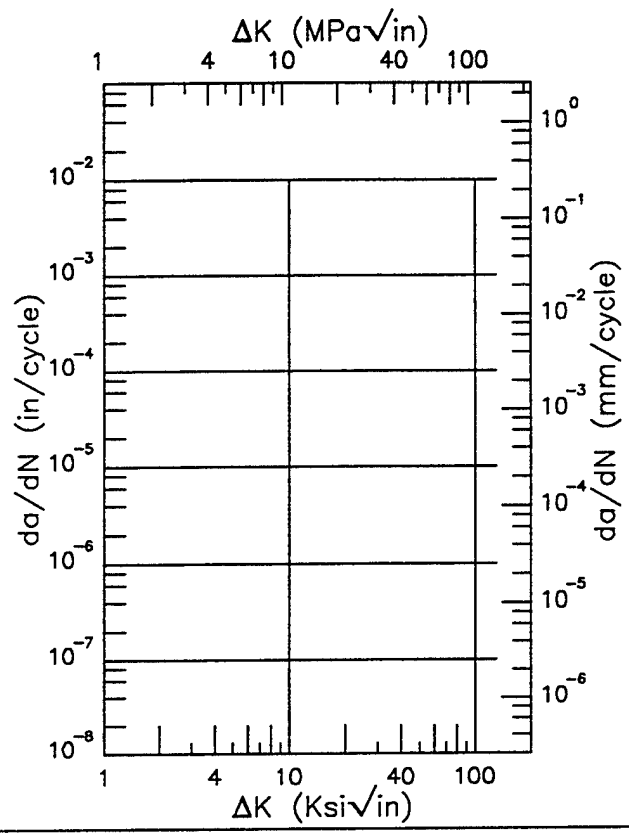
Figure 6.16.3.1.111

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.
Frequency: 15 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.40 (min)	0.365
10.	0.646
12.61 (max)	2.09

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
17.28	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

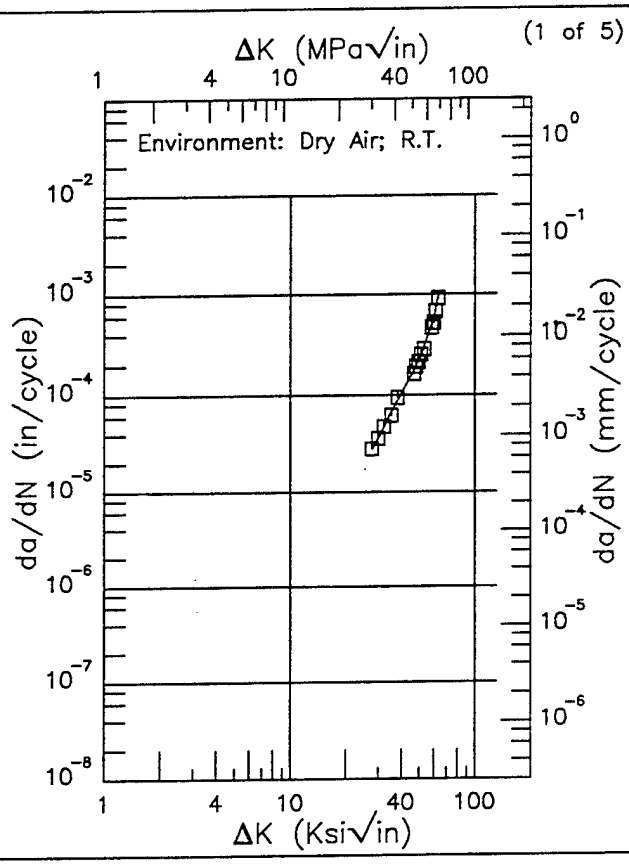
Figure 6.16.3.1.111 (Concluded)

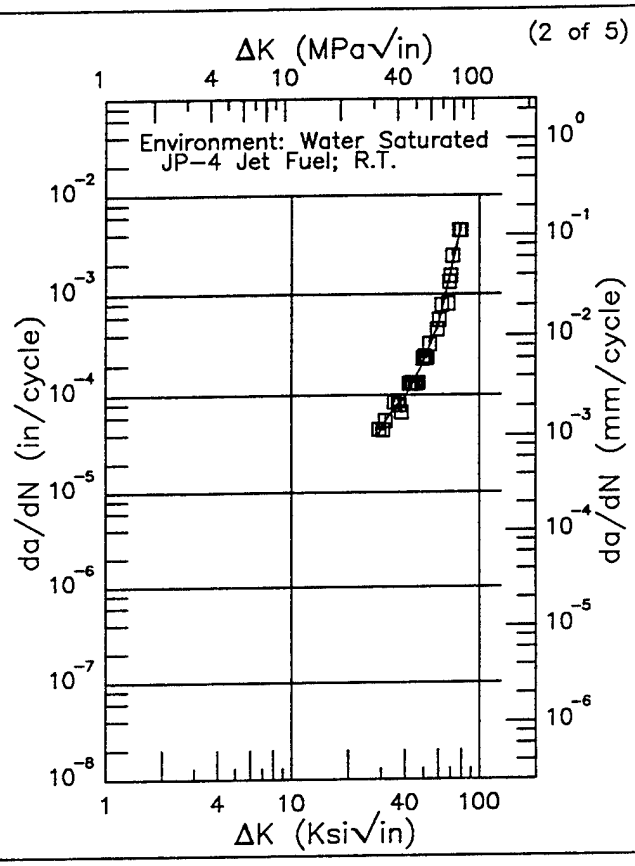
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.66 (min)	28.5
30.	36.5
35.	66.4
40.	103.
50.	225.
60.	572.
62.76 (max)	914.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
28.99 (min)	39.1
30.	46.5
35.	73.2
40.	93.7
50.	216.
60.	491.
70.	1567.
79.39 (max)	4895.

RMS % Error	Life Prediction Ratio Summary
4.09	0. .5 .8 1.25 2.

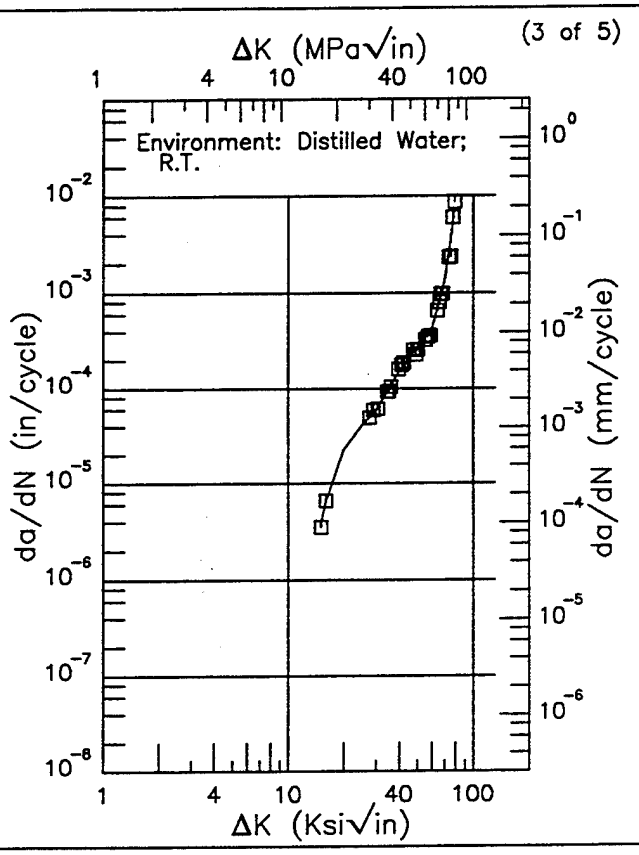
RMS % Error	Life Prediction Ratio Summary
13.27	0. .5 .8 1.25 2.

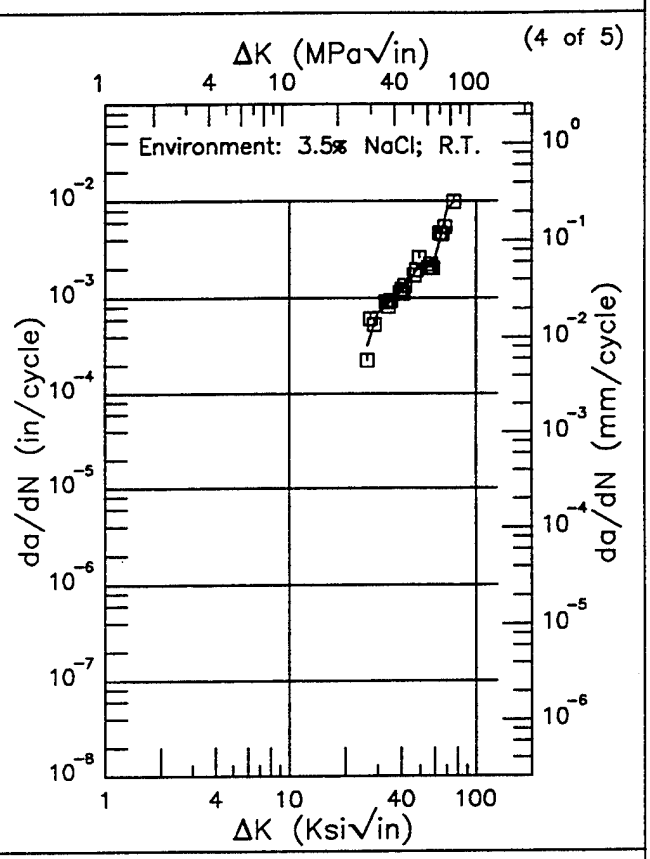
Figure 6.16.3.1.112

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.90 (min)	3.68
16.	6.74
20.	22.5
25.	40.4
30.	59.8
35.	96.4
40.	154.
50.	270.
60.	428.
70.	1327.
78.93 (max)	7237.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.28 (min)	321.
30.	697.
35.	928.
40.	1173.
50.	2144.
60.	2469.
70.	8074.
75.42 (max)	9712.

RMS % Error	Life Prediction Ratio Summary
10.54	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.28	0. .5 .8 1.25 2.

Figure 6.16.3.1.112 (Continued)

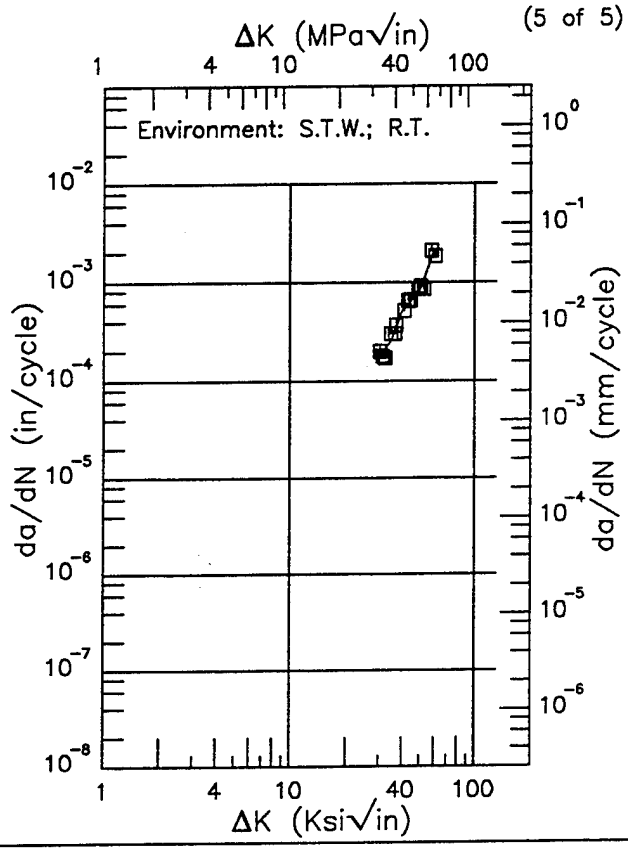
Ti–6Al–4V

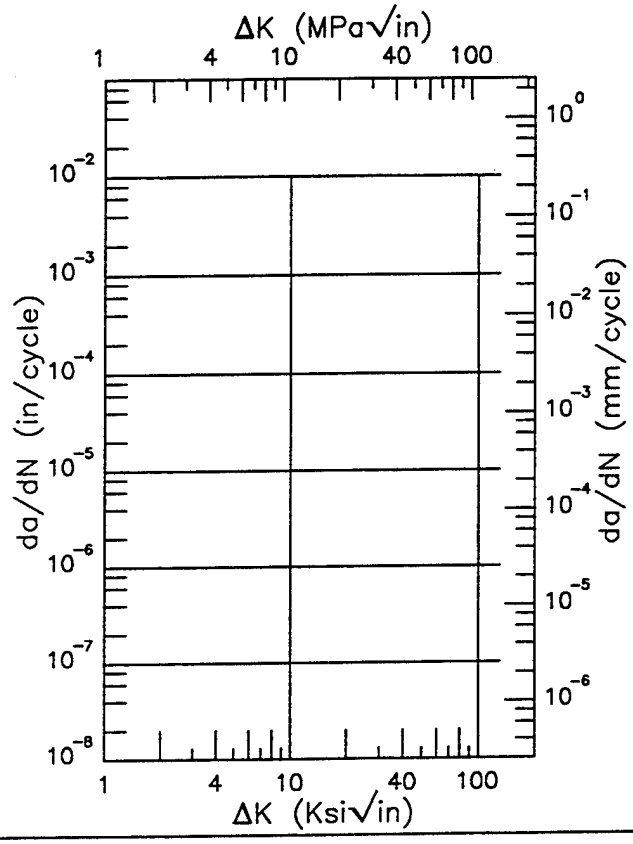
E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

(5 of 5)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
30.23 (min)	179.
35.	260.
40.	507.
50.	821.
60.	2088.
60.36 (max)	2106.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
12.35	0. .5 .8 1.25 2.

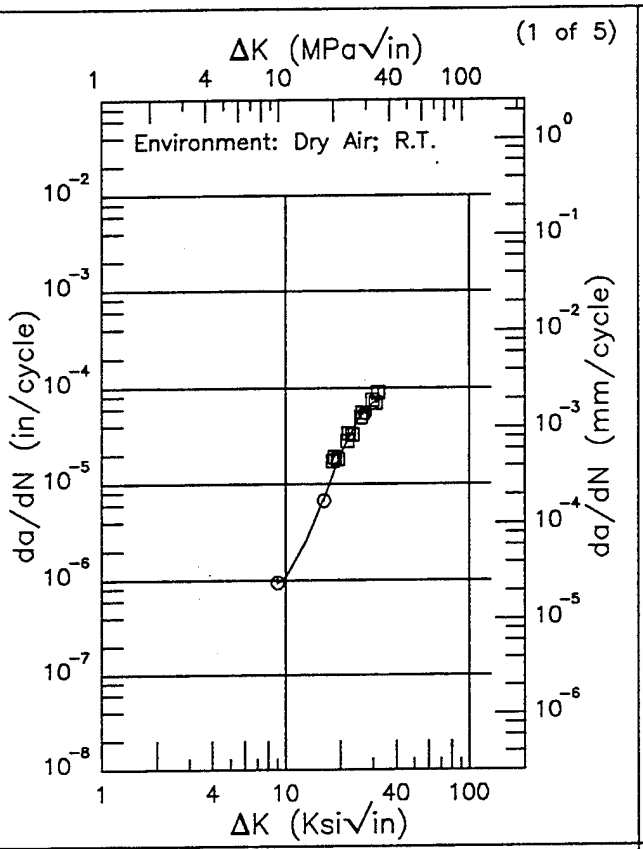
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

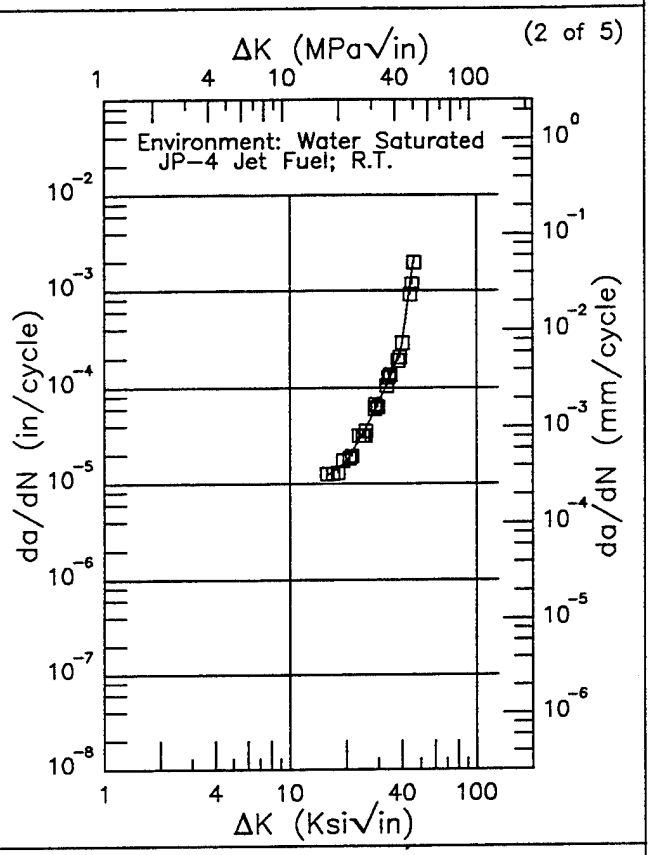
Figure 6.16.3.1.112 (Concluded)

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.99 (min)	0.930
9.	0.930
10.	1.08
13.	2.57
16.	6.86
20.	20.4
25.	48.6
30.	70.2
31.84 (max)	72.2

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.67 (min)	12.1
16.	12.2
20.	17.2
25.	35.1
30.	71.4
35.	136.
40.	274.
46.00 (max)	2017.

RMS % Error	Life Prediction Ratio Summary
16.54	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.48	0. .5 .8 1.25 2.

Figure 6.16.3.1.113

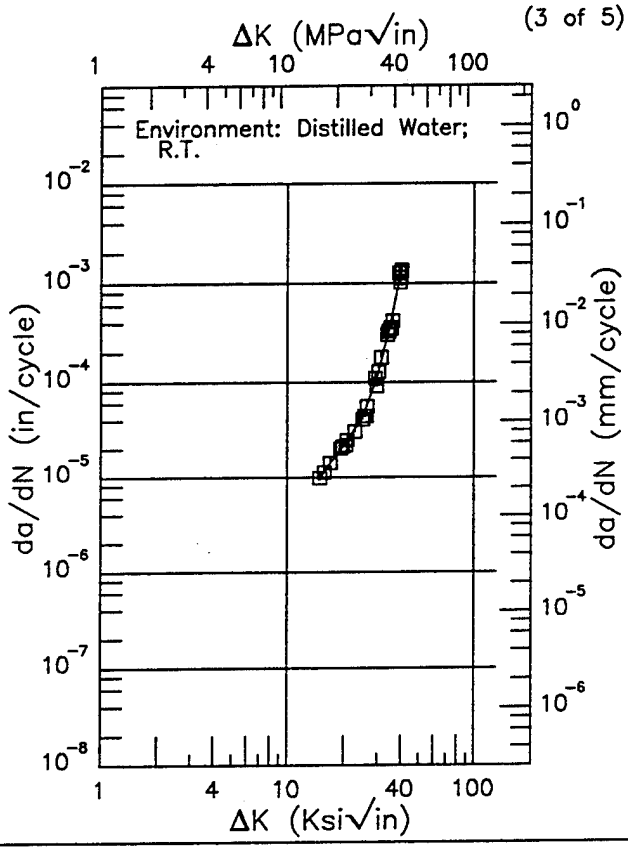
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

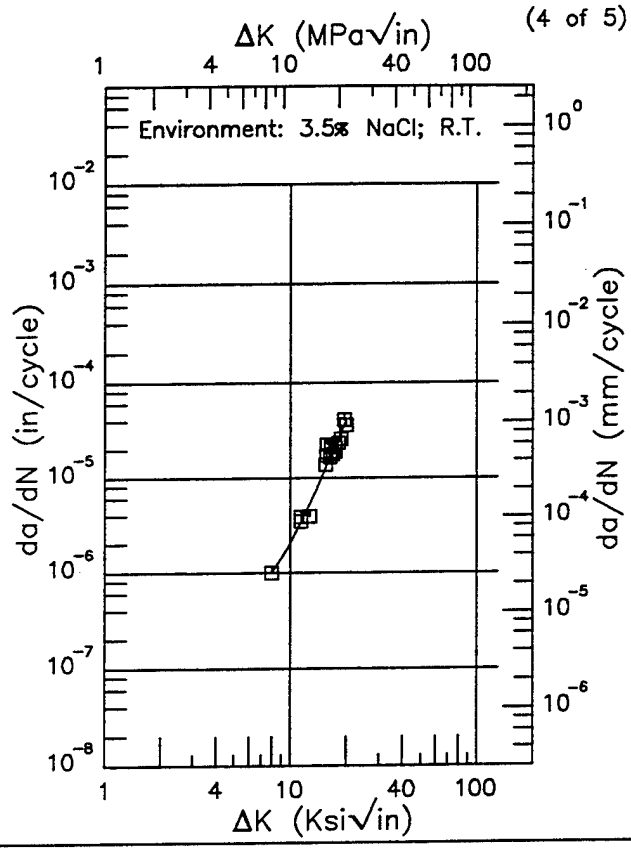
(3 of 5)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.81 (min)	9.39
16.	12.2
20.	21.8
25.	43.4
30.	117.
35.	391.
40.	1347.
40.19 (max)	1411.

RMS % Error	Life Prediction Ratio Summary
11.14	0. .5 .8 1.25 2.

(4 of 5)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.97 (min)	0.998
8.	1.01
9.	1.42
10.	2.03
13.	5.75
16.	14.5
19.93 (max)	40.2

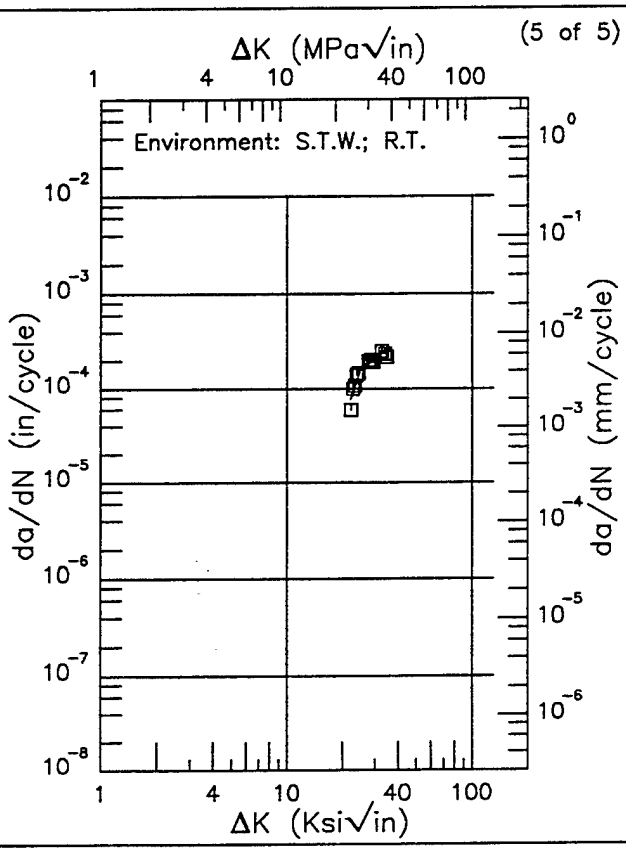
RMS % Error	Life Prediction Ratio Summary
22.59	0. .5 .8 1.25 2.

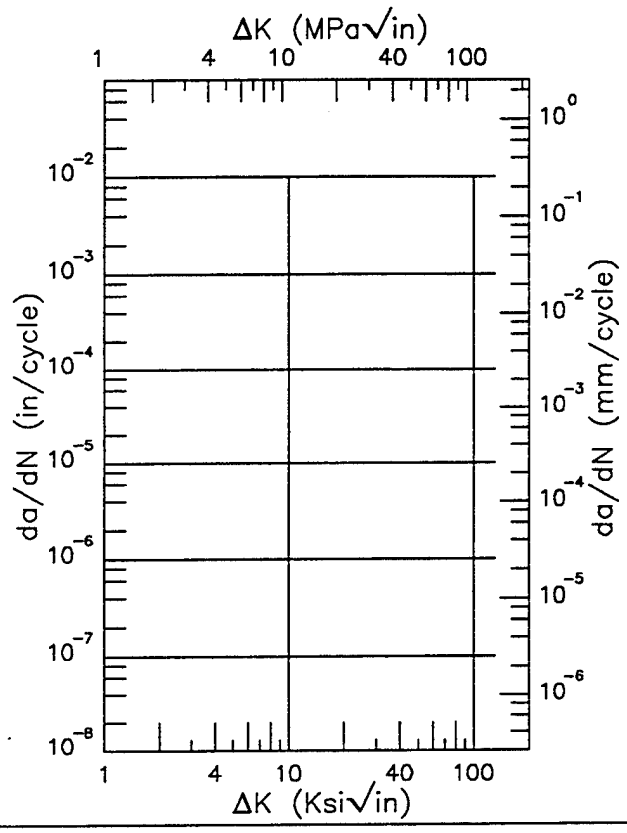
Figure 6.16.3.1.113 (Continued)

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
22.18 (min)	77.7
25.	160.
30.	209.
34.79 (max)	262.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
12.42	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.16.3.1.113 (Concluded)

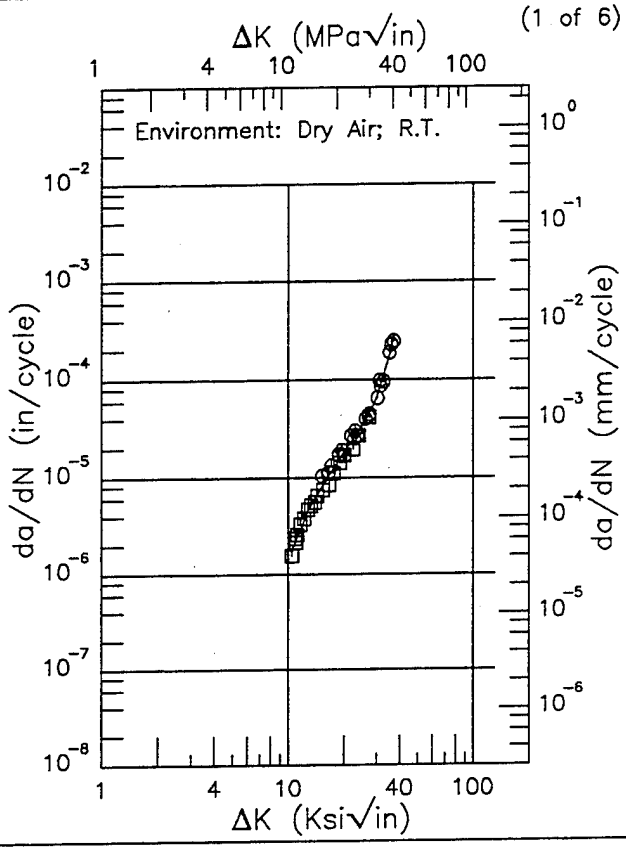
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

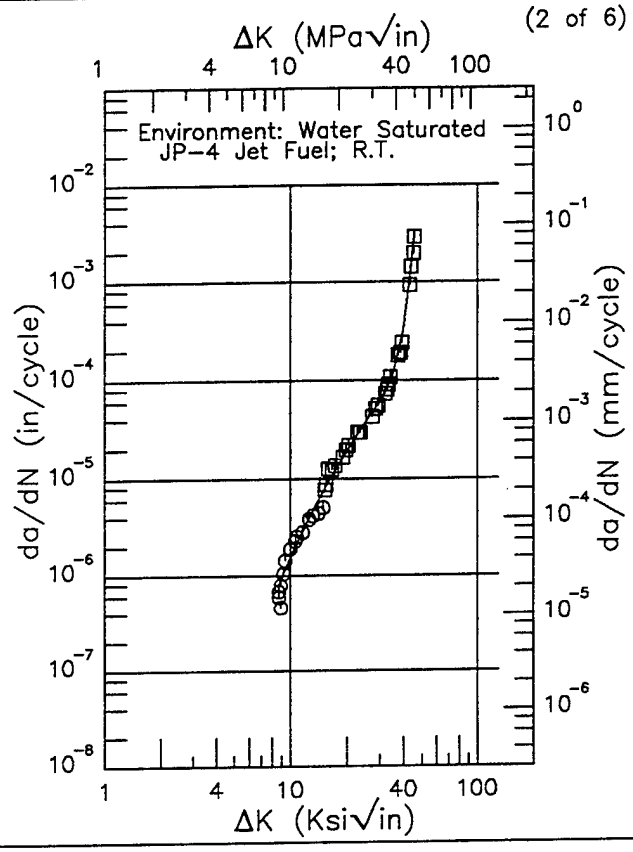
(1 of 6)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.40 (min)	1.74
13.	4.95
16.	9.60
20.	18.2
25.	33.6
30.	63.8
35.	171.
37.05 (max)	267.

RMS % Error	Life Prediction Ratio Summary
11.40	0. .5 .8 1.25 2.

(2 of 6)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.65 (min)	0.774
9.	0.943
10.	1.55
13.	4.49
16.	9.27
20.	19.1
25.	37.0
30.	60.0
35.	112.
40.	327.
45.45 (max)	2981.

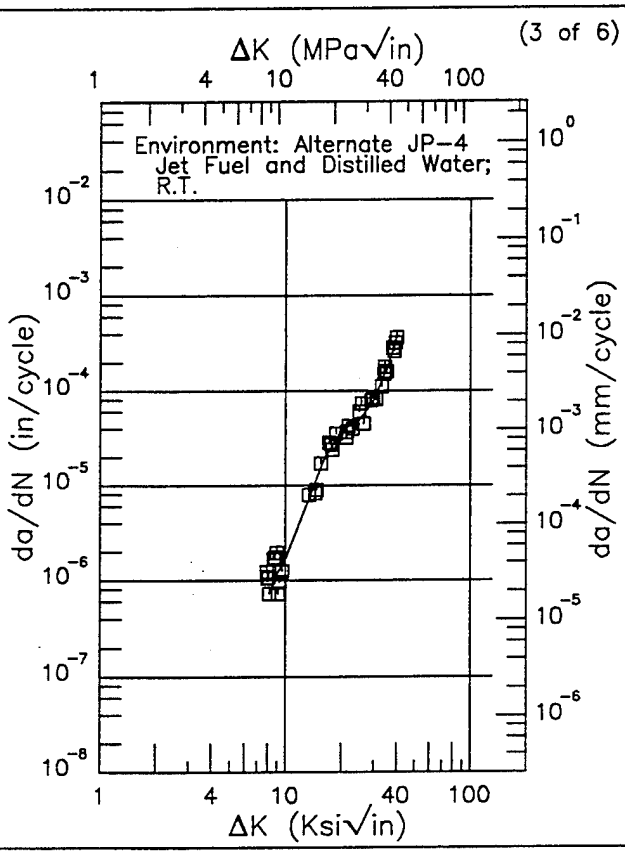
RMS % Error	Life Prediction Ratio Summary
16.68	0. .5 .8 1.25 2.

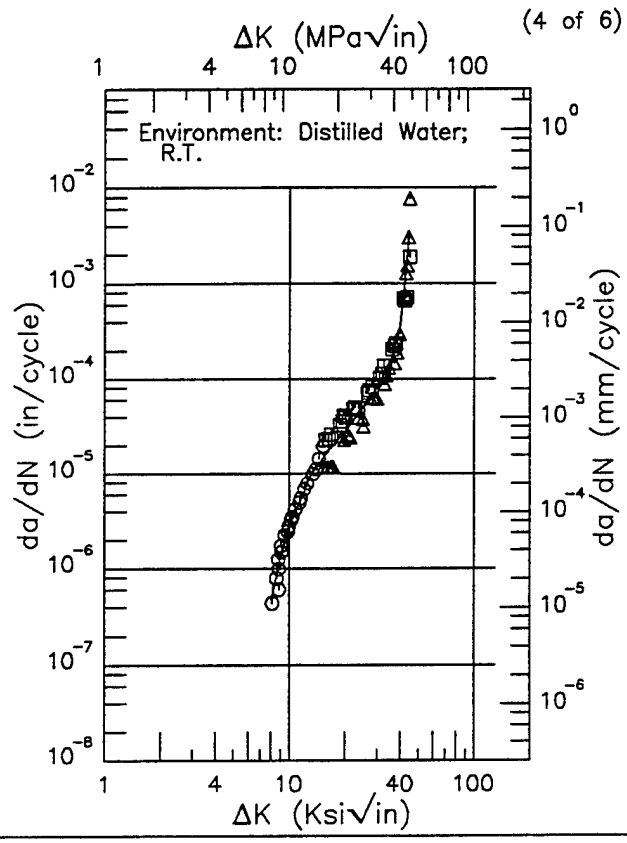
Figure 6.16.3.1.114

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.94 (min)	0.985
8.	0.986
9.	1.17
10.	1.66
13.	6.23
16.	18.4
20.	37.8
25.	49.5
30.	77.9
35.	168.
39.99 (max)	349.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.08 (min)	0.475
9.	1.29
10.	2.77
13.	9.43
16.	16.6
20.	28.0
25.	49.3
30.	82.5
35.	147.
40.	372.
44.64 (max)	3246.

RMS % Error	Life Prediction Ratio Summary
23.26	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
29.23	0. .5 .8 1.25 2.

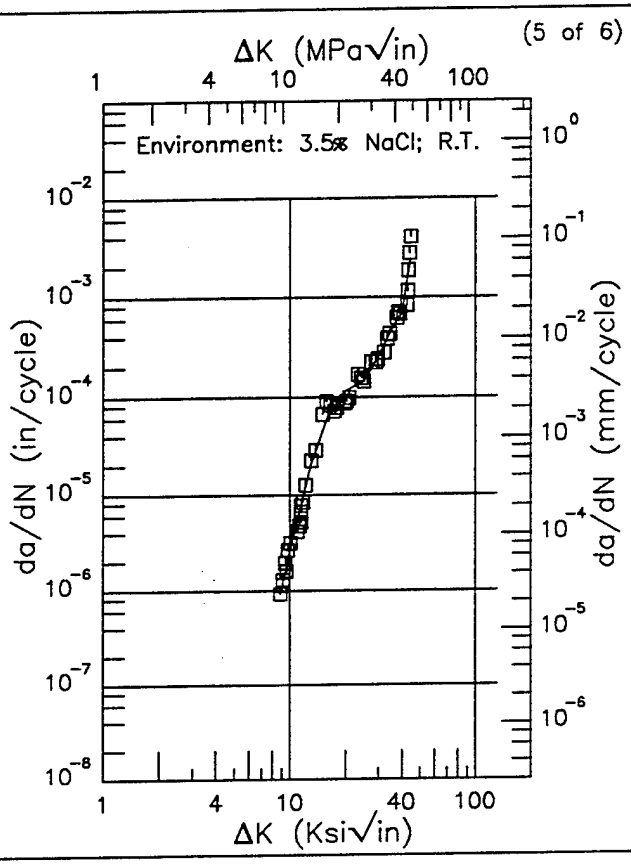
Figure 6.16.3.1.114 (Continued)

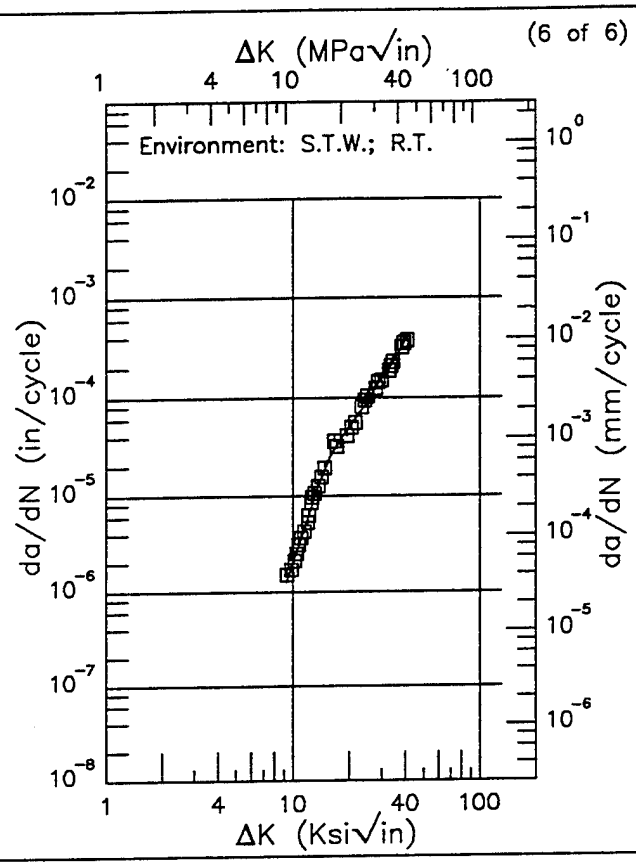
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.86 (min)	0.946
9.	1.08
10.	2.67
13.	20.4
16.	65.4
20.	115.
25.	147.
30.	261.
35.	464.
40.	698.
44.53 (max)	2388.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.27 (min)	1.26
10.	2.01
13.	9.57
16.	26.0
20.	51.3
25.	88.7
30.	160.
35.	235.
40.	377.
40.49 (max)	406.

RMS % Error	Life Prediction Ratio Summary
22.38	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
9.34	0. .5 .8 1.25 2.

Figure 6.16.3.1.114 (Concluded)

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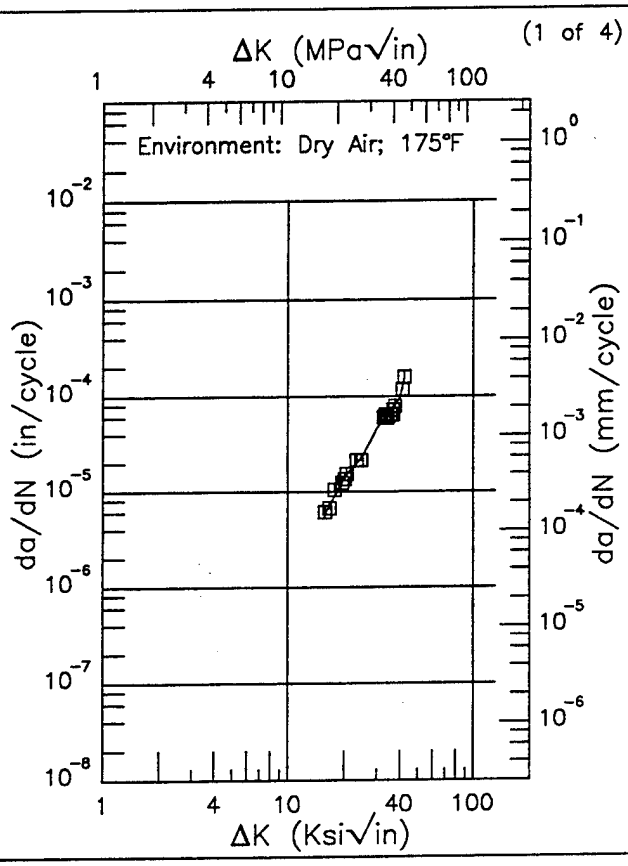
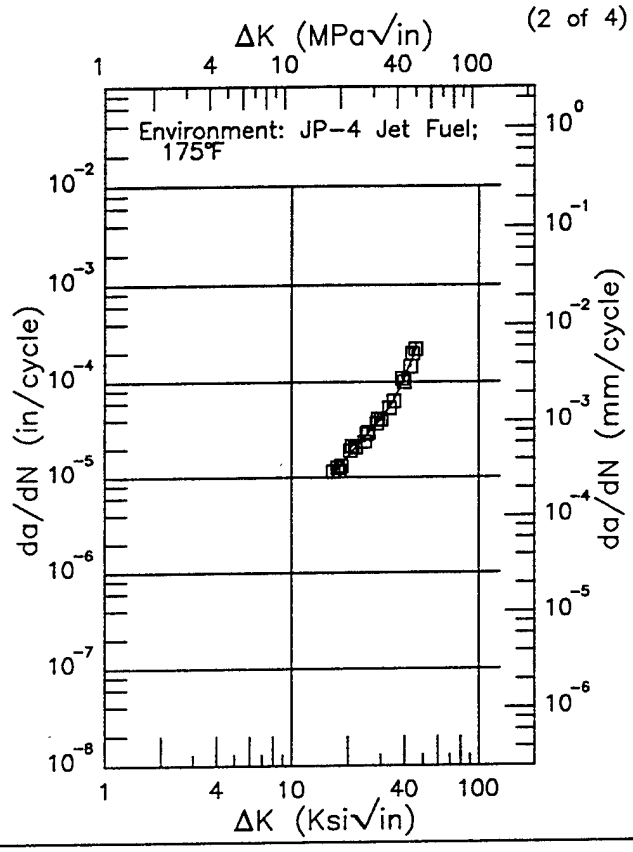
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.65 (min)	5.45
16.	6.24
20.	13.9
25.	23.6
30.	46.1
35.	66.0
40.	97.7
42.30 (max)	156.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.60 (min)	10.7
20.	16.7
25.	27.4
30.	40.7
35.	63.2
40.	110.
45.72 (max)	215.

RMS % Error	Life Prediction Ratio Summary
7.82	0. .5 .8 1.25 2.

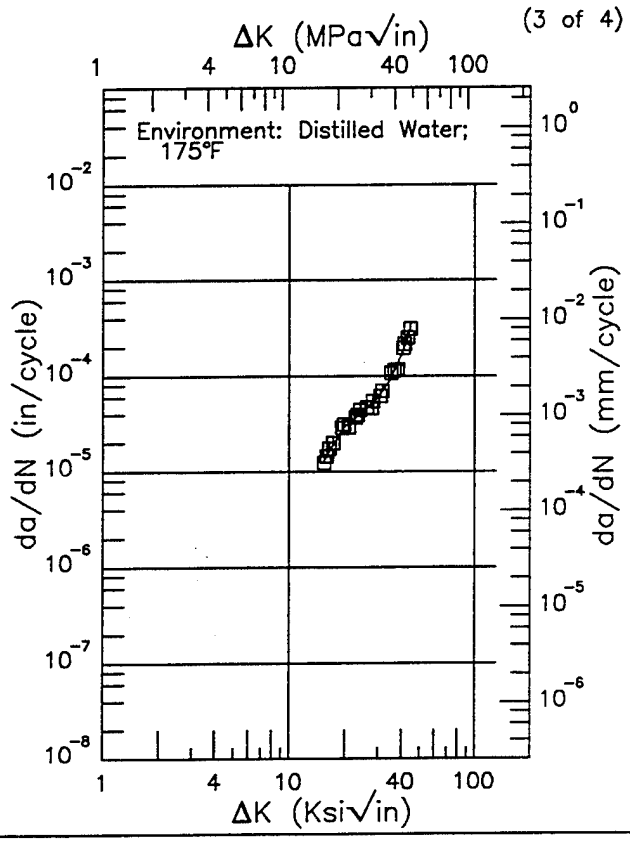
RMS % Error	Life Prediction Ratio Summary
6.58	0. .5 .8 1.25 2.

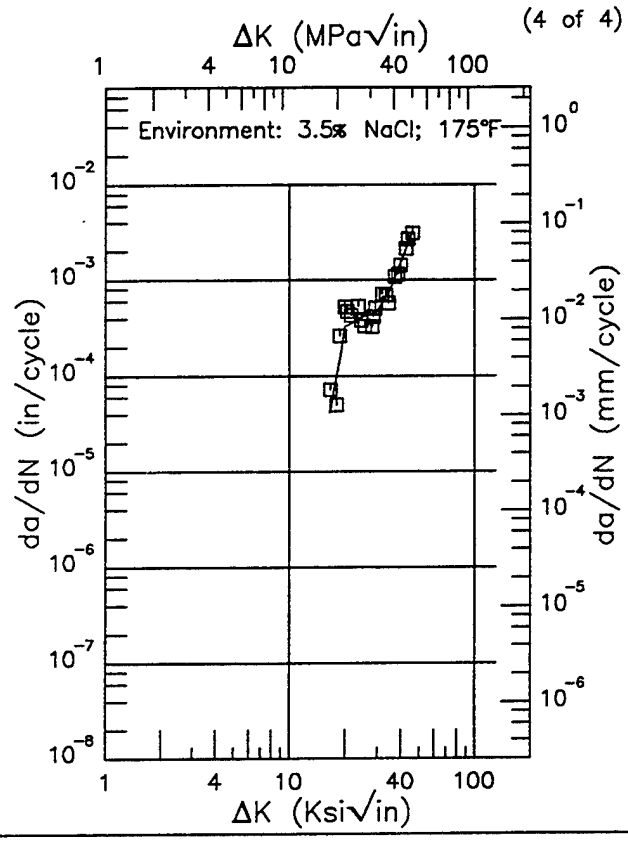
Figure 6.16.3.1.115

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.44 (min)	12.7
16.	15.0
20.	29.8
25.	43.2
30.	60.3
35.	94.7
40.	168.
44.48 (max)	304.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.62 (min)	41.8
20.	326.
25.	416.
30.	474.
35.	786.
40.	1507.
46.18 (max)	3196.

RMS % Error	Life Prediction Ratio Summary
6.23	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
33.19	0. .5 .8 1.25 2.

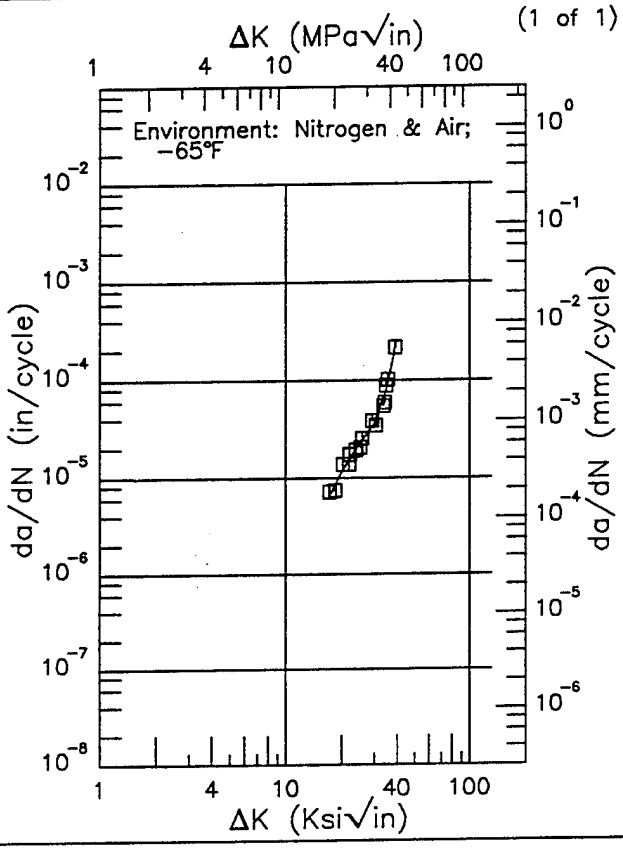
Figure 6.16.3.1.115 (Concluded)

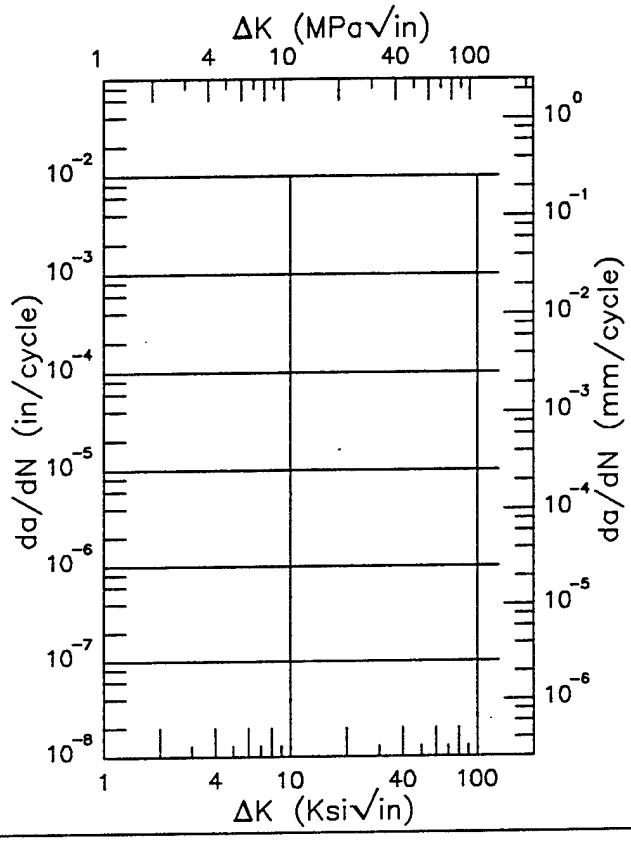
Ti–6Al–4V

E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.05 (min)	6.45
20.	11.5
25.	23.0
30.	36.0
35.	82.3
39.00 (max)	218.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.50	0. .5 .8 1.25 2.

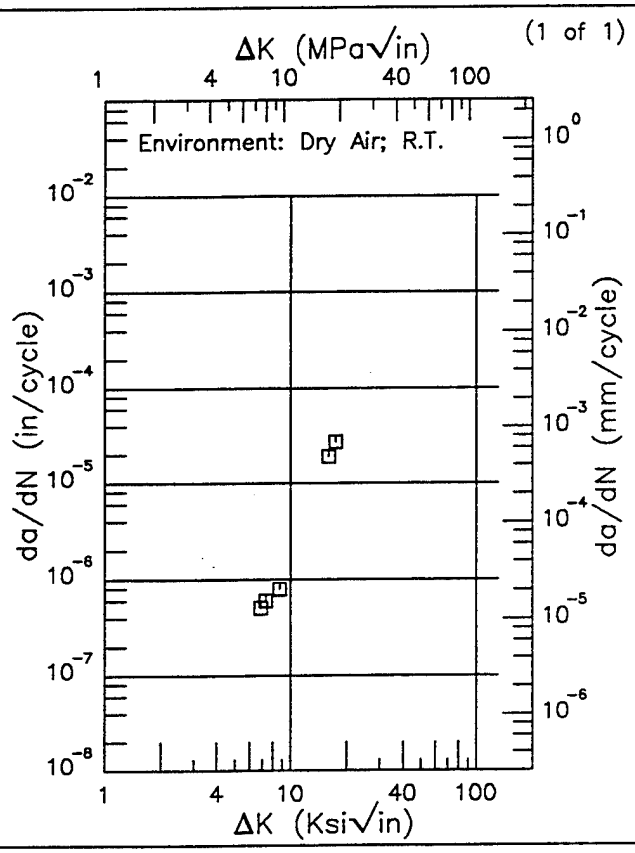
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

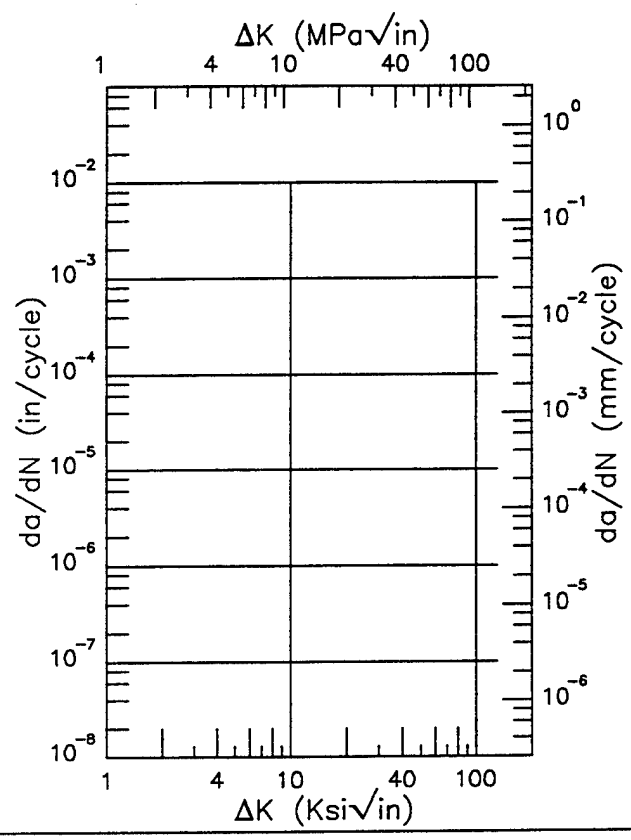
Figure 6.16.3.1.116

Ti–6Al–4V E

Condition/Ht: RA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.8
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

Figure 6.16.3.1.117

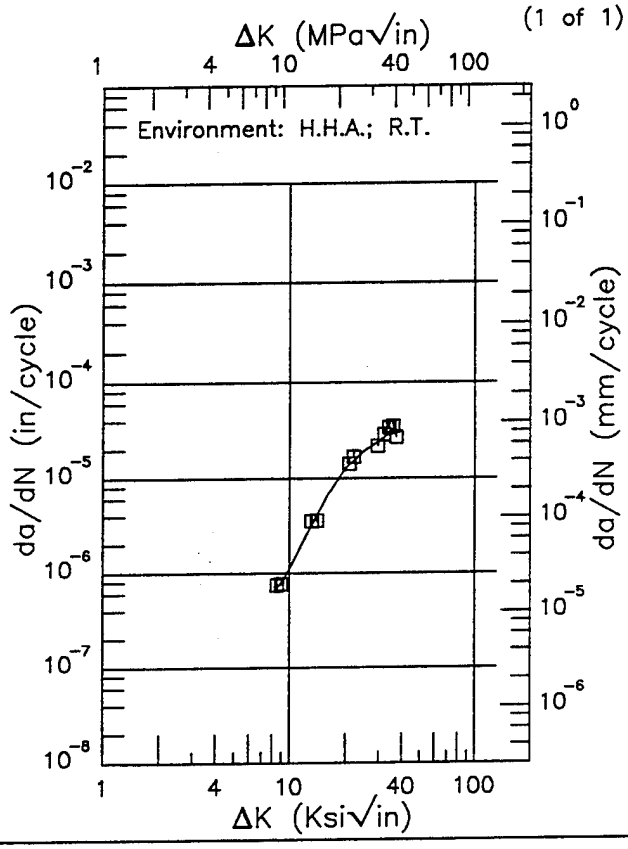
Ti–6Al–4V

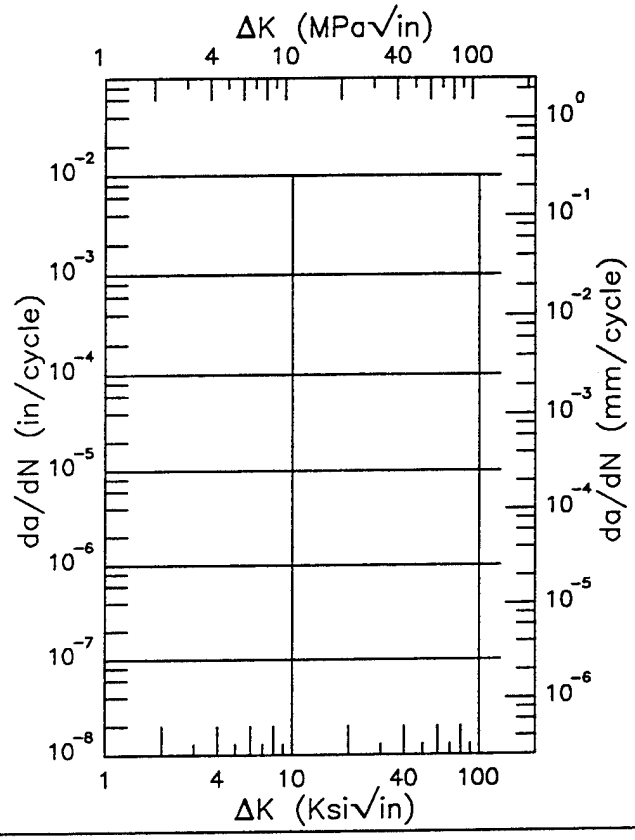
E

Condition/Ht: RA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: L–S
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 119.1 ksi
Ult. Strength: 138.1 ksi
Specimen Thk: 0.376 in.
Specimen Width: 5 in.
Ref: 90981

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.50 (min)	0.676
9.	0.789
10.	1.11
13.	3.02
16.	6.66
20.	12.8
25.	19.3
30.	24.2
35.	30.9
37.14 (max)	35.6

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.89	0. .5 .8 1.25 2.

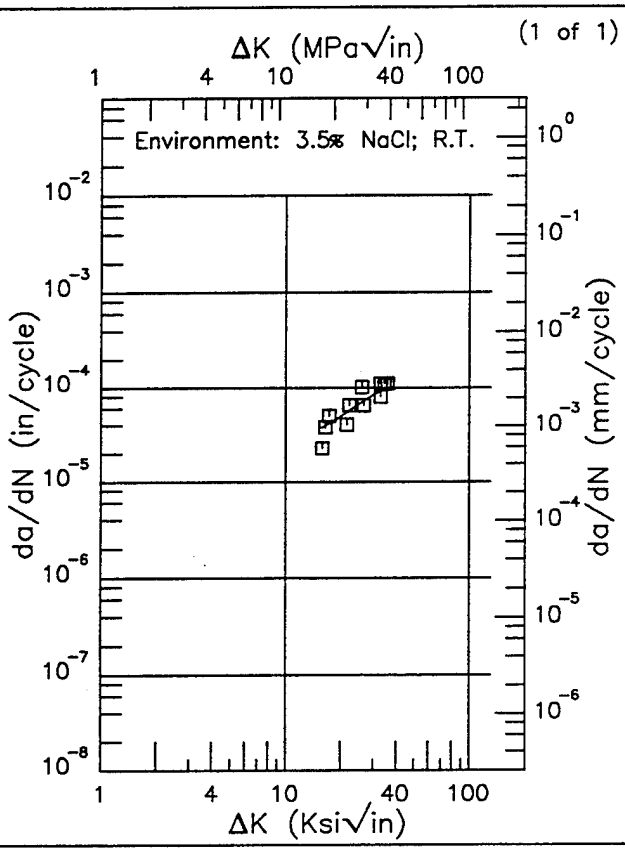
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

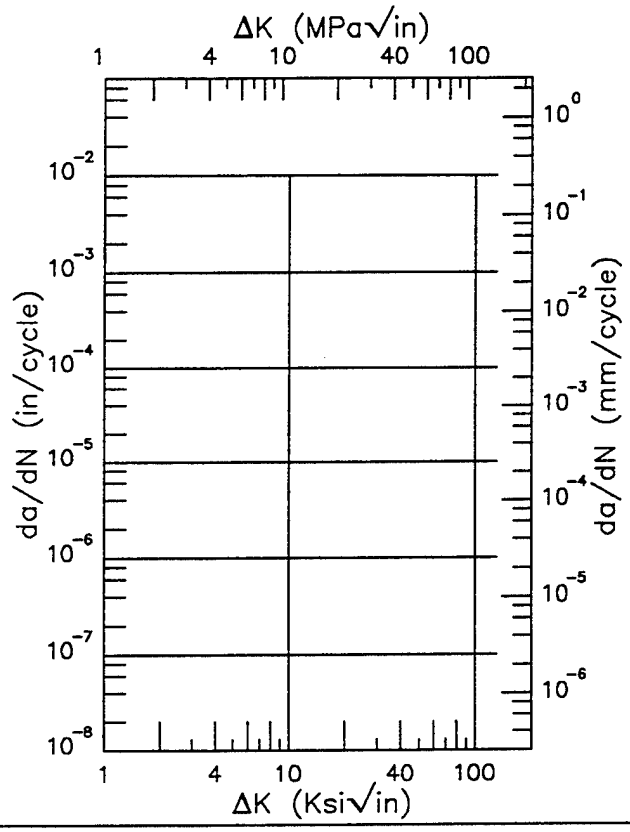
Figure 6.16.3.1.118

Ti–6Al–4V E

Condition/Ht: RA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: T–S
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 141.7 ksi
Ult. Strength: 151.8 ksi
Specimen Thk: 0.377 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.77 (min)	37.3
16.	37.9
20.	49.7
25.	67.2
30.	84.6
35.	99.2
35.80 (max)	101.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 22.73

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.16.3.1.119

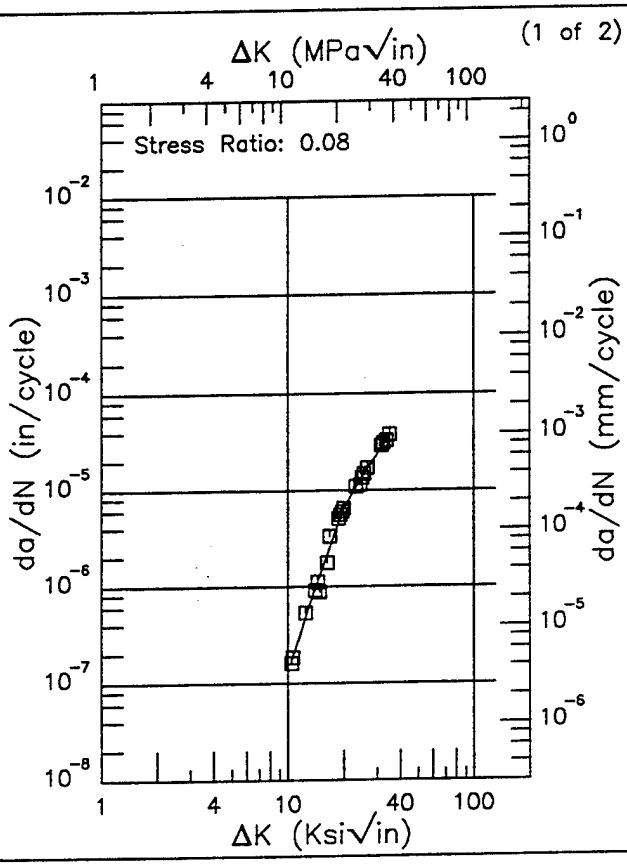
R

Ti–6Al–4V

Condition/Ht: RA
Form: 4 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 121 ksi
Ult. Strength: 132 ksi
Specimen Thk: 1 in.
Specimen Width: 7.4 in.
Ref: 88579

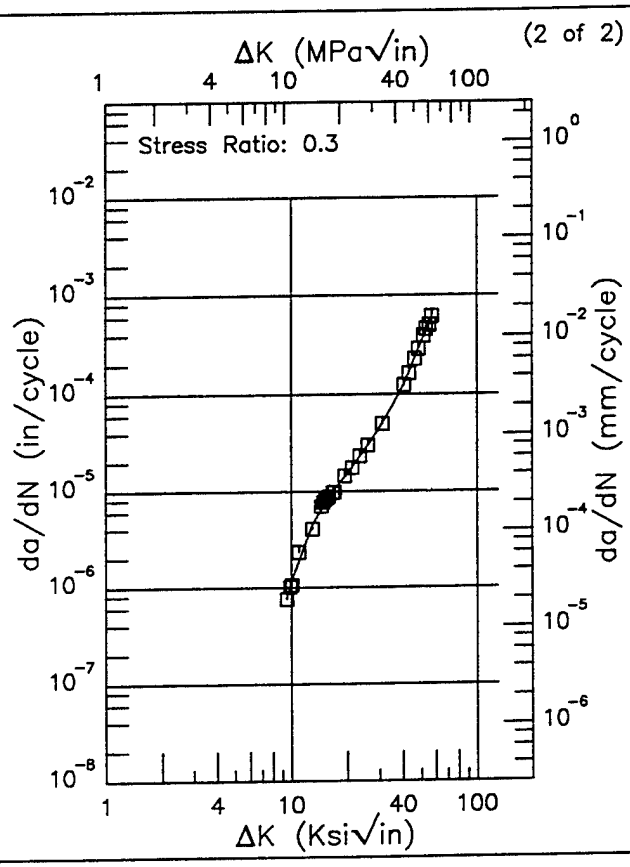
(1 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.40 (min)	0.169
13.	0.621
16.	1.98
20.	6.58
25.	14.0
30.	23.7
34.94 (max)	36.1

RMS % Error	Life Prediction Ratio Summary
11.95	0. .5 .8 1.25 2.

(2 of 2)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.44 (min)	0.770
10.	1.16
13.	4.53
16.	8.92
20.	15.5
25.	27.2
30.	45.9
35.	74.5
40.	120.
50.	339.
57.20 (max)	579.

RMS % Error	Life Prediction Ratio Summary
6.62	0. .5 .8 1.25 2.

Figure 6.16.3.1.120

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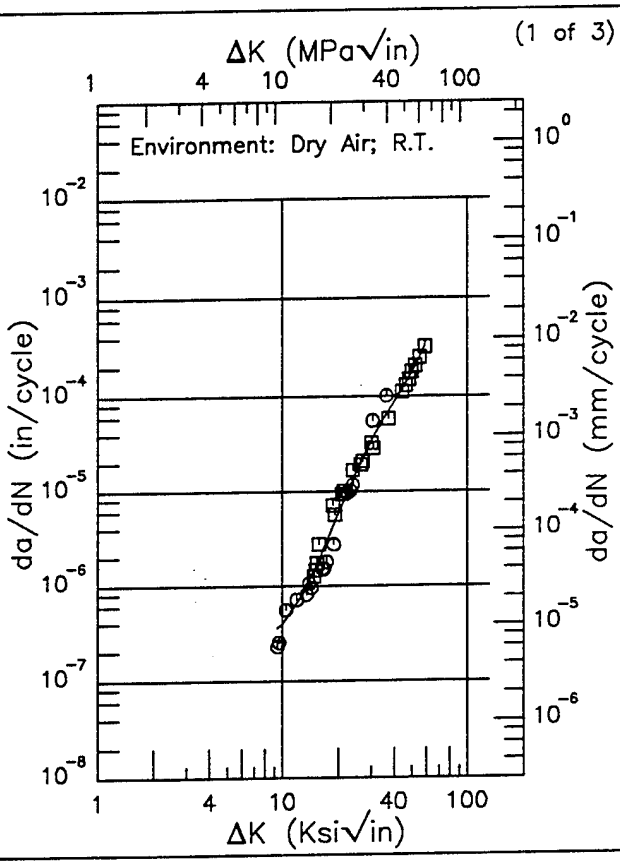
Ti–6Al–4V

E

Condition/Ht: RA
Form: 4 in. Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08
Frequency: 1 Hz

Yield Strength: 121 – 123 ksi
Ult. Strength: 132 – 136 ksi
Specimen Thk: 0.9 – 1 in.
Specimen Width: 6 – 7.4 in.
Ref: 88579

(1 of 3)



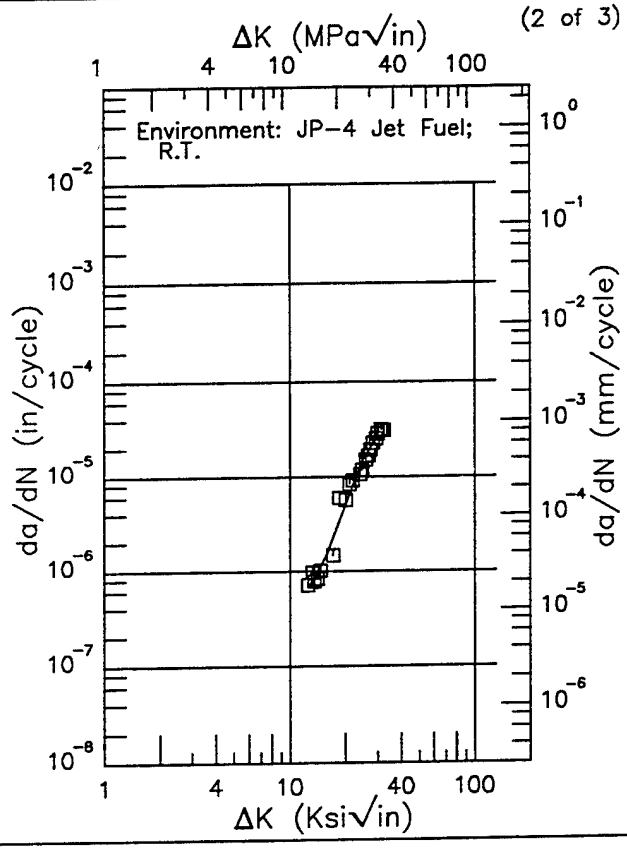
ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.37 (min)	0.355
10.	0.392
13.	0.834
16.	2.01
20.	5.83
25.	16.3
30.	34.4
35.	58.5
40.	86.9
50.	173.
58.69 (max)	321.

RMS % Error 26.35

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

(2 of 3)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.53 (min)	0.682
13.	0.727
16.	1.51
20.	4.95
25.	15.3
30.	26.5
32.23 (max)	28.2

RMS % Error 22.61

Life Prediction Ratio Summary

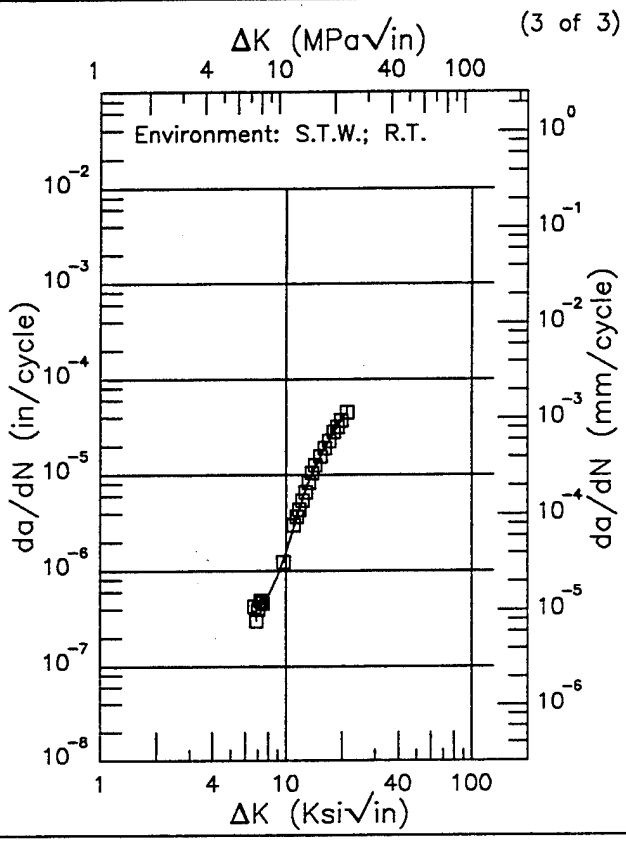
0. .5 .8 1.25 2.

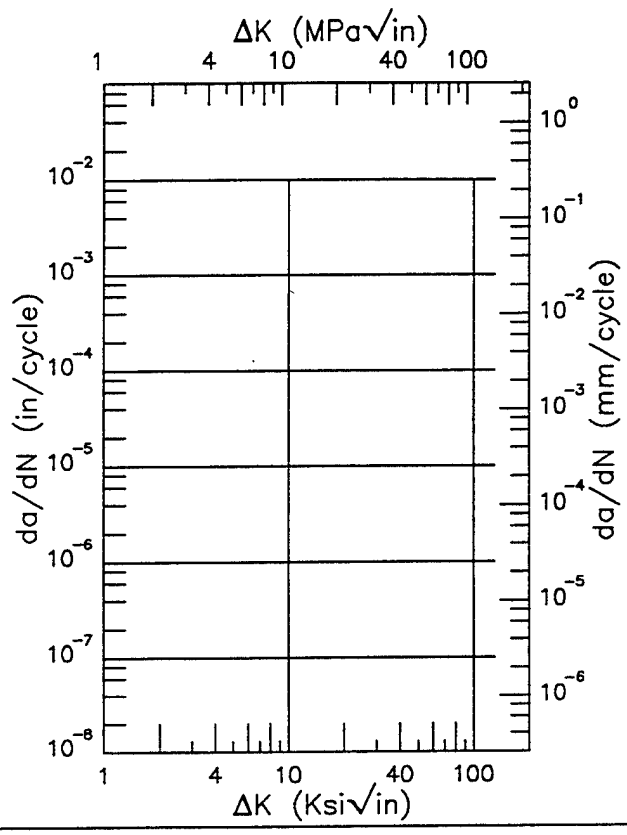
Figure 6.16.3.1.121

Ti–6Al–4V E

Condition/Ht: RA
Form: 4 in. Forging
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.08
Frequency: 1 Hz

Yield Strength: 121 – 123 ksi
Ult. Strength: 132 – 136 ksi
Specimen Thk: 0.9 – 1 in.
Specimen Width: 6 – 7.4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.72 (min)	0.376
7.	0.395
8.	0.553
9.	0.902
10.	1.58
13.	7.93
16.	18.7
20.	38.8
21.08 (max)	44.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 6.92

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

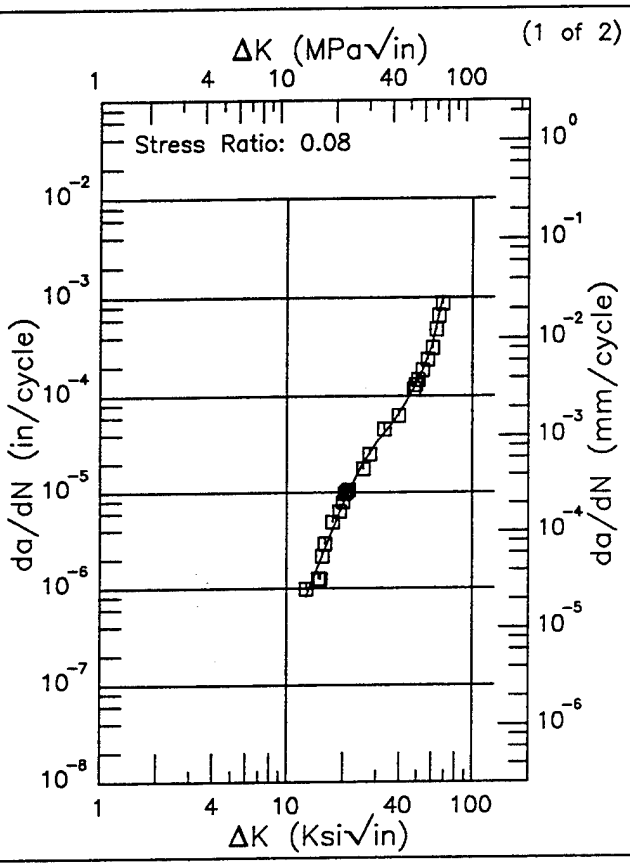
Figure 6.16.3.1.121 (Concluded)

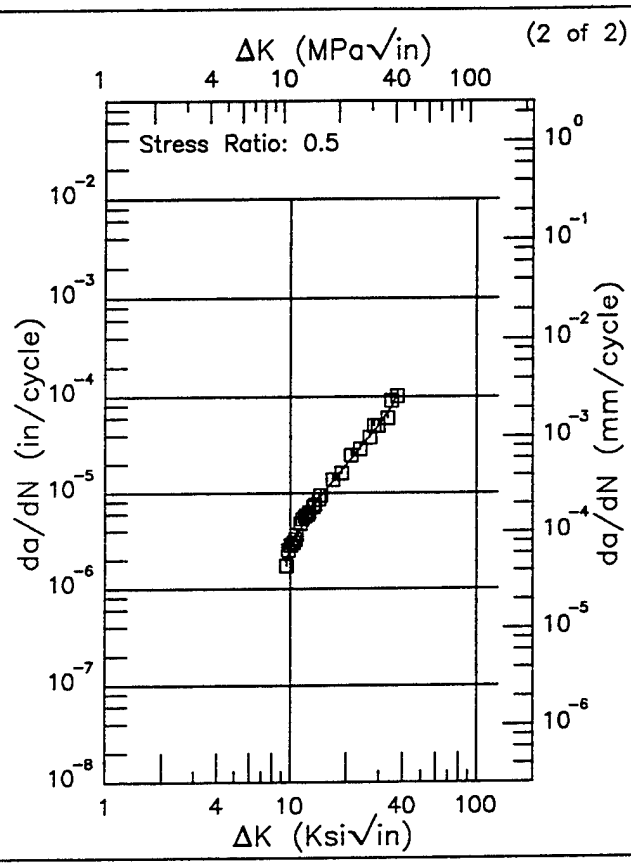
Ti–6Al–4V

R

Condition/Ht: RA
Form: 4 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 6 Hz
Environment: DRY AIR; RT

Yield Strength: 119 – 128 ksi
Ult. Strength: 127 – 136 ksi
Specimen Thk: 1 in.
Specimen Width: 7.4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.73 (min)	0.819
13.	0.908
16.	2.57
20.	7.57
25.	19.0
30.	33.0
35.	47.9
40.	66.7
50.	137.
60.	317.
68.69 (max)	940.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.49 (min)	1.98
10.	2.62
13.	6.93
16.	11.5
20.	19.7
25.	33.7
30.	51.2
35.	79.7
37.30 (max)	105.

RMS % Error	Life Prediction Ratio Summary
13.14	0. .5 .8 1.25 2.

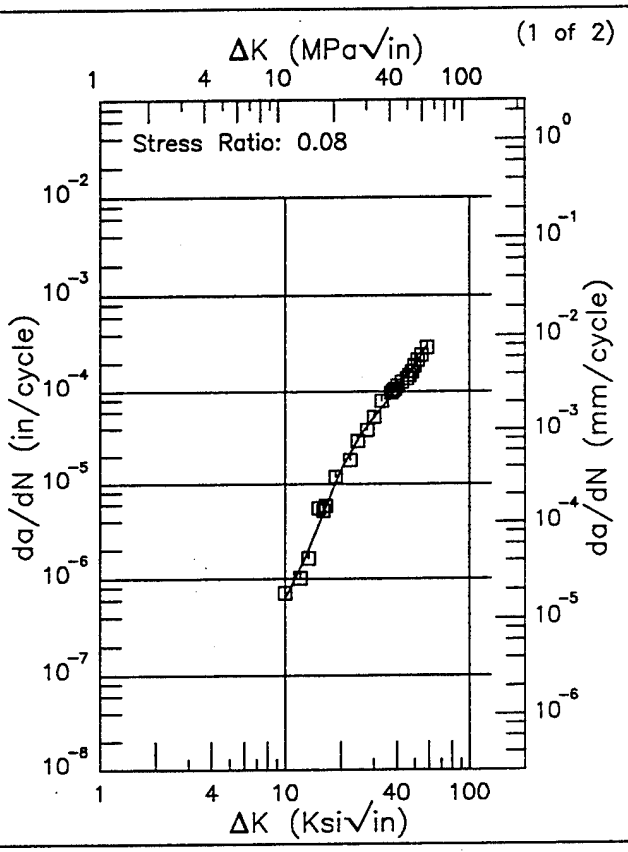
RMS % Error	Life Prediction Ratio Summary
7.98	0. .5 .8 1.25 2.

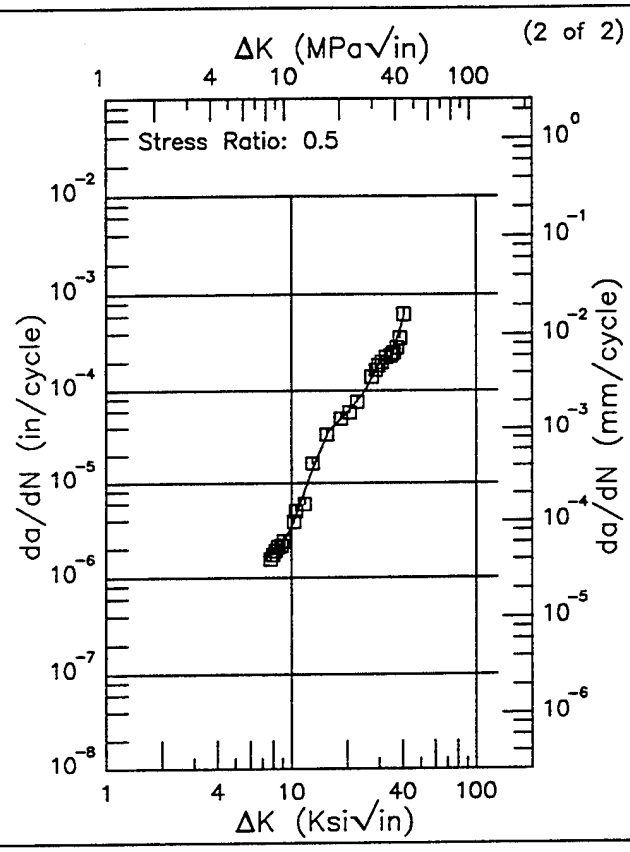
Figure 6.16.3.1.122

Ti–6Al–4V R

Condition/Ht: RA
Form: 4 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 128 ksi
Ult. Strength: 136 ksi
Specimen Thk: 0.66 – 0.77 in.
Specimen Width: 7.4 in.
Ref: 88579



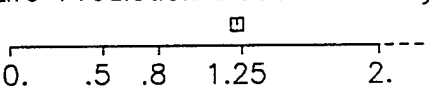


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.95 (min)	0.610
10.	0.619
13.	1.74
16.	4.87
20.	14.2
25.	32.2
30.	52.4
35.	77.7
40.	111.
50.	185.
58.05 (max)	303.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.69 (min)	1.78
8.	1.78
9.	2.25
10.	3.41
13.	14.3
16.	36.9
20.	58.0
25.	98.6
30.	196.
35.	238.
40.	539.
40.43 (max)	628.

RMS % Error 13.38

Life Prediction Ratio Summary



RMS % Error 9.35

Life Prediction Ratio Summary

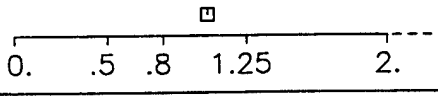


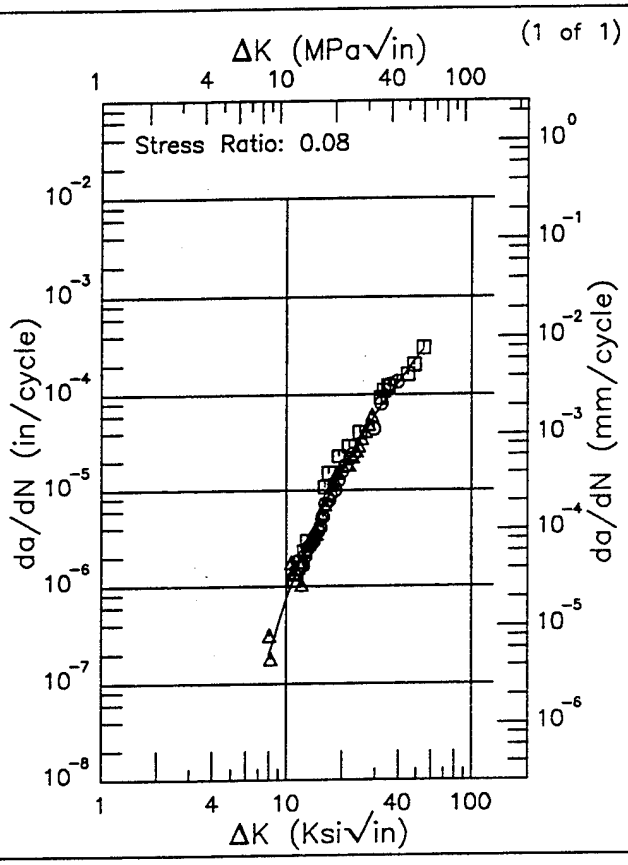
Figure 6.16.3.1.123

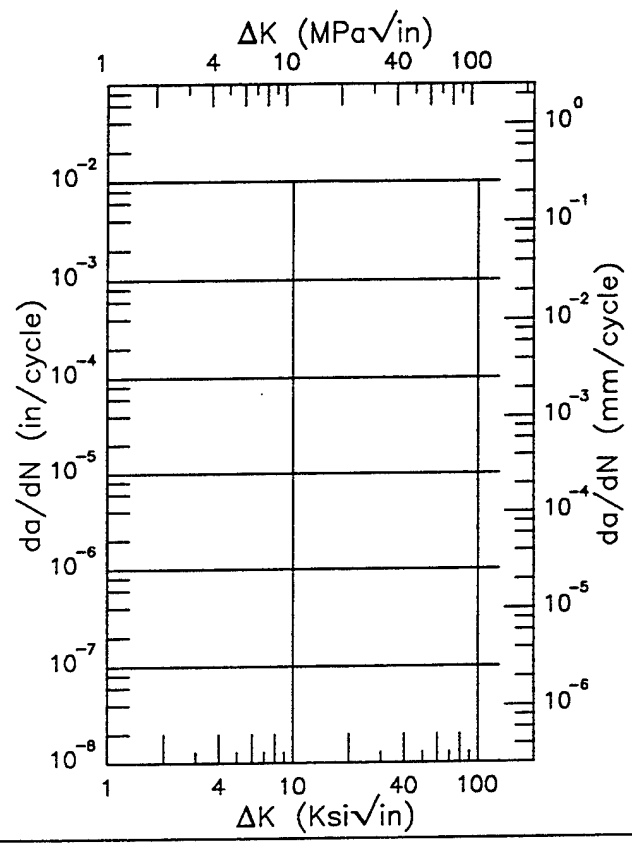
R

Ti–6Al–4V

Condition/Ht: RA
Form: 4 in. Forging
Specimen Type: CT
Orientation: T–L
Frequency: 1 Hz
Environment: S.T.W.; RT

Yield Strength: 119 – 124 ksi
Ult. Strength: 127 – 136 ksi
Specimen Thk: 0.91 – 1.01 in.
Specimen Width: 6 – 7.4 in.
Ref: 88579





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.02 (min)	0.203
9.	0.412
10.	0.752
13.	2.87
16.	7.16
20.	16.9
25.	35.8
30.	62.0
35.	95.2
40.	135.
50.	235.
54.52 (max)	290.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
24.09	⊙ ⊡ △ 0. .5 .8 1.25 2.

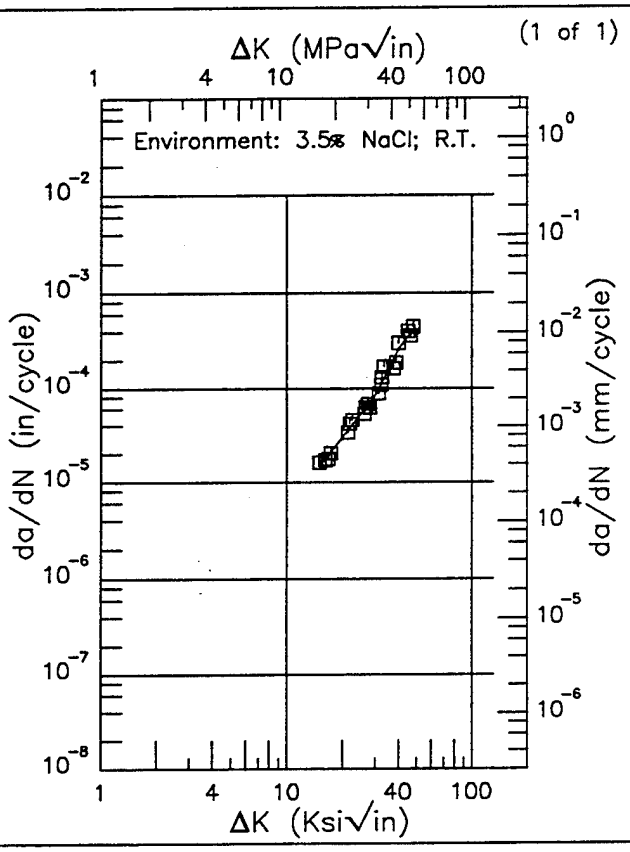
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

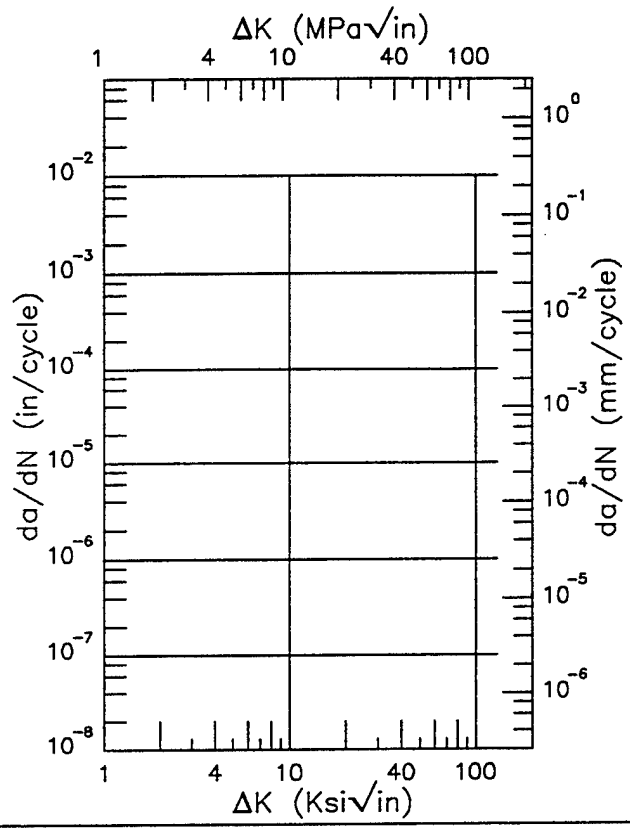
Figure 6.16.3.1.124

Ti–6Al–4V E

Condition/Ht: RA(FAST COOLED)
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.96 (min)	15.2
16.	17.2
20.	29.7
25.	52.4
30.	84.0
35.	151.
40.	265.
47.90 (max)	420.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
13.11	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

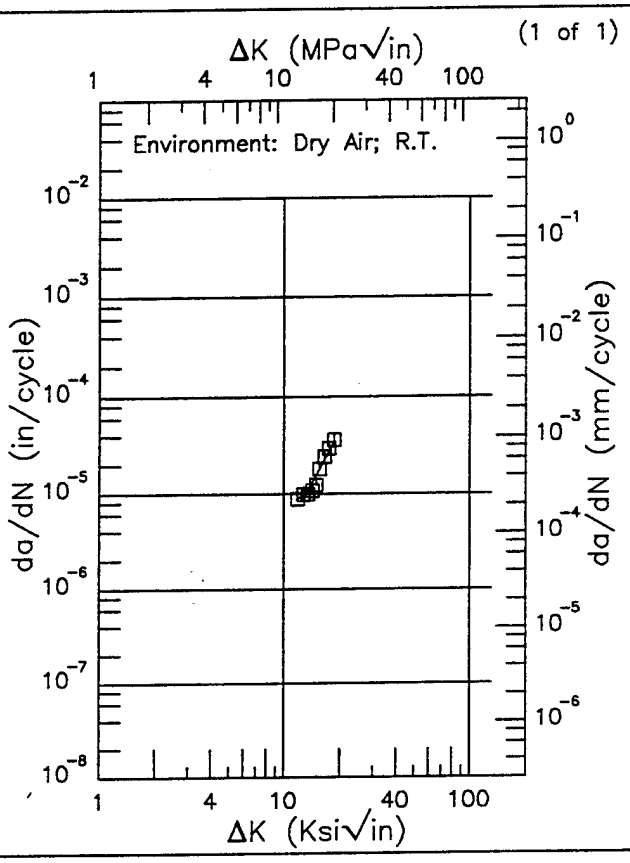
Figure 6.16.3.1.125

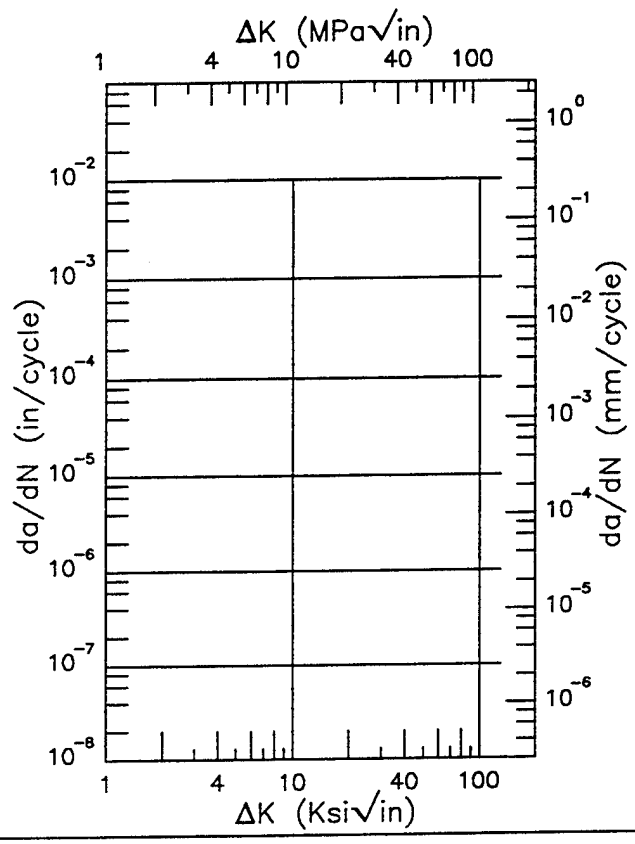
Ti–6Al–4V

E

Condition/Ht: STOA
Form: 0.62 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.3
Frequency: 1 Hz

Yield Strength: 140 ksi
Ult. Strength: 150 ksi
Specimen Thk: 0.491 in.
Specimen Width: 6 in.
Ref: 85837





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.82 (min)	8.99
13.	9.53
16.	20.1
18.56 (max)	35.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
10.07	0. .5 .8 1.25 2.

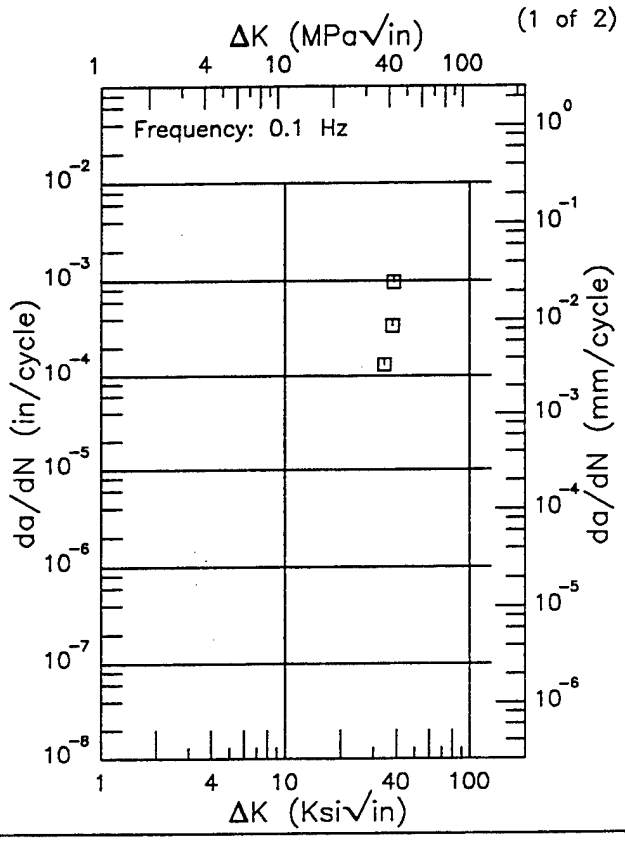
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

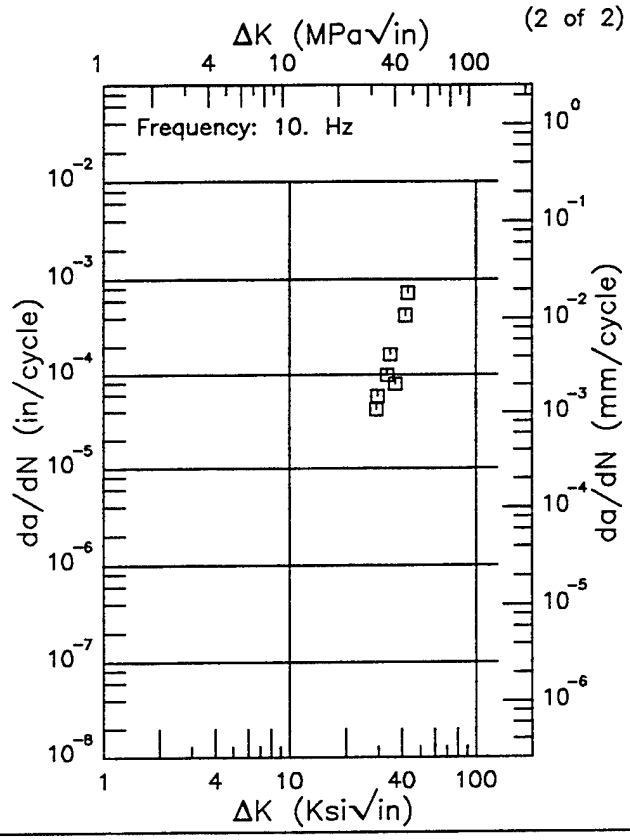
Figure 6.16.3.1.126

Ti–6Al–4V F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR;–65°F

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

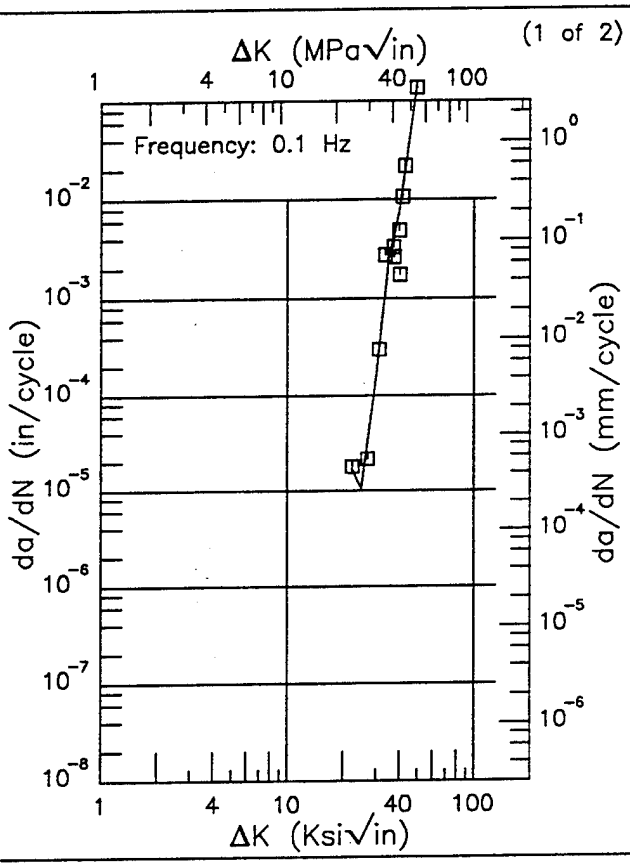
Figure 6.16.3.1.127

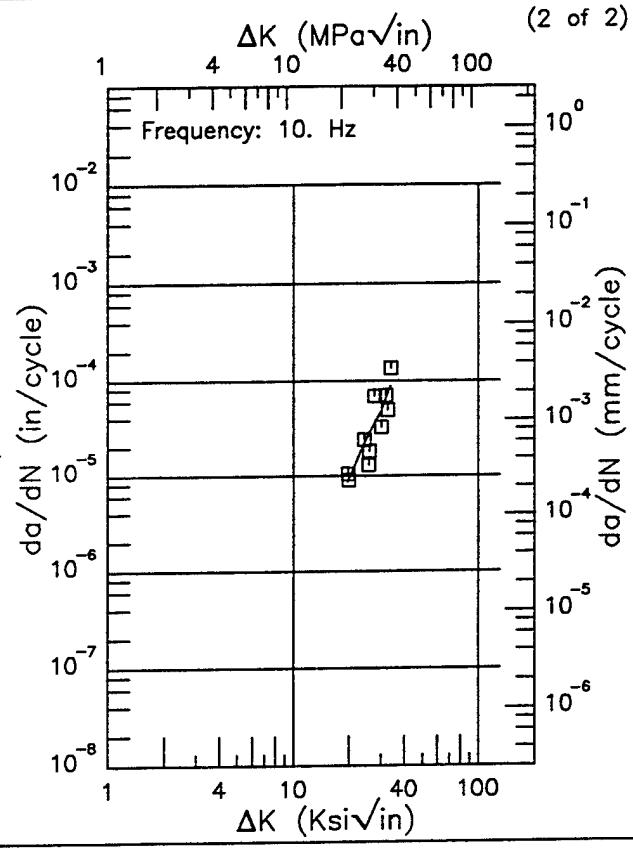
Ti–6Al–4V

F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: 3.5% NACL; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
22.24 (min)	17.1
25.	10.5
30.	152.
35.	2519.
40.	7755.
49.52 (max)	148646.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.78 (min)	8.64
20.	9.28
25.	24.8
30.	47.3
33.73 (max)	87.7

RMS % Error	Life Prediction Ratio Summary
48.35	0. .5 .8 1.25 2.

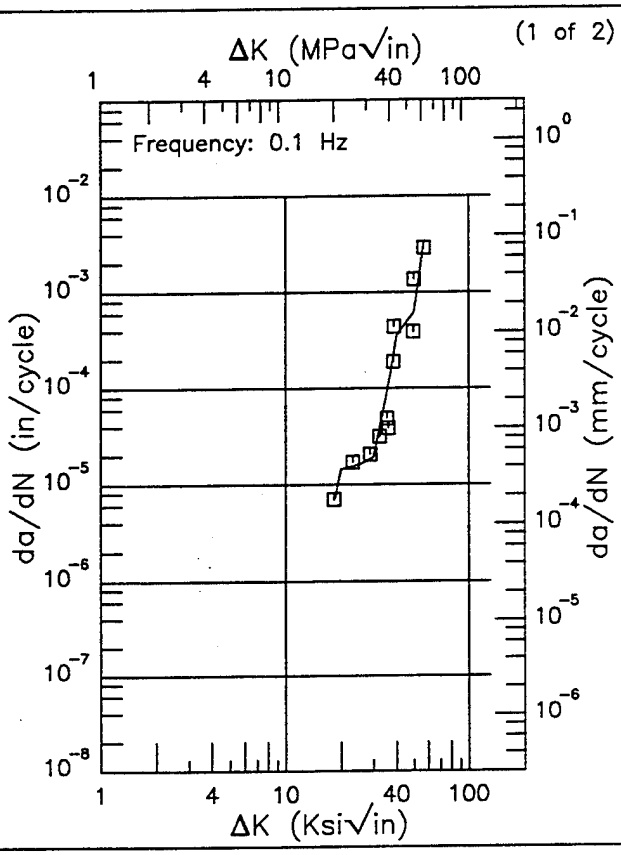
RMS % Error	Life Prediction Ratio Summary
43.38	0. .5 .8 1.25 2.

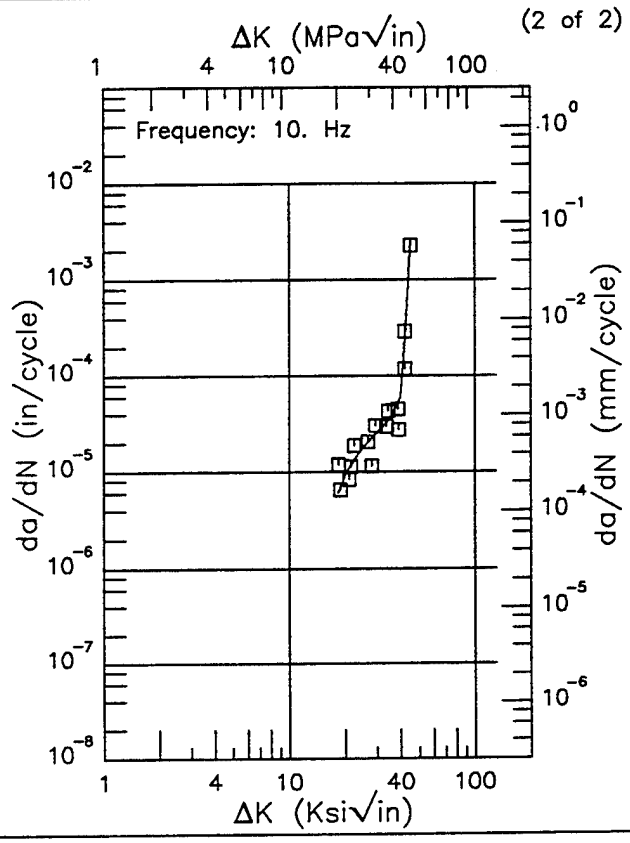
Figure 6.16.3.1.128

Ti–6Al–4V F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: JP4; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.23 (min)	6.87
20.	14.6
25.	16.1
30.	19.1
35.	80.1
40.	358.
50.	621.
56.28 (max)	2893.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.39 (min)	6.05
20.	9.36
25.	17.8
30.	25.7
35.	35.2
40.	60.6
45.20 (max)	2543.

RMS % Error	Life Prediction Ratio Summary
51.87	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
37.44	0. .5 .8 1.25 2.

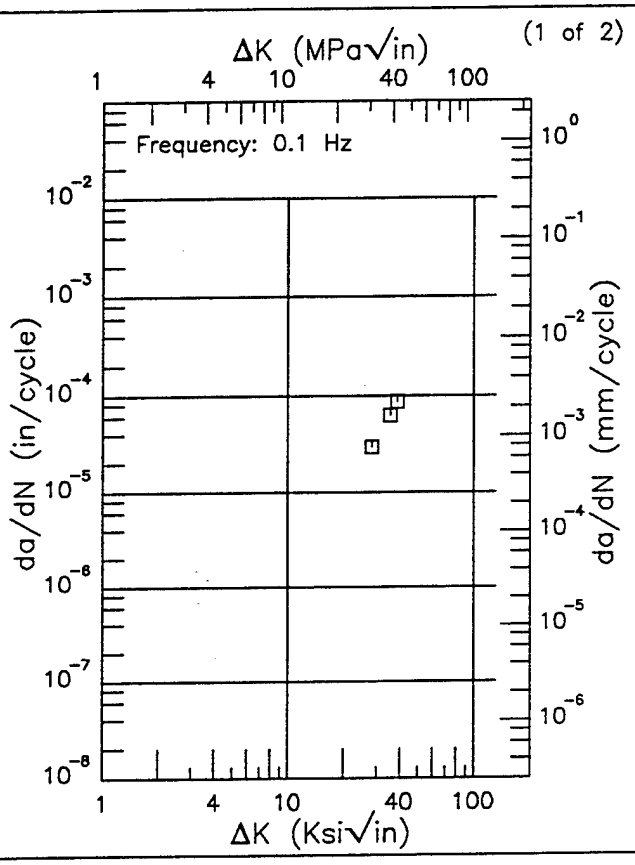
Figure 6.16.3.1.129

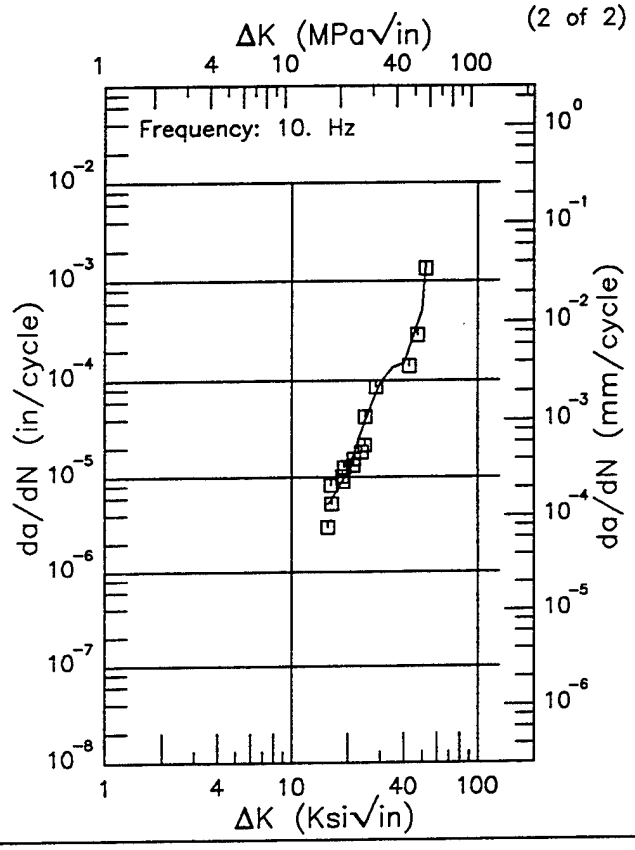
Ti–6Al–4V

F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.64 (min)	5.22
16.	5.32
20.	11.3
25.	39.6
30.	92.7
35.	137.
40.	150.
50.	508.
52.34 (max)	1436.

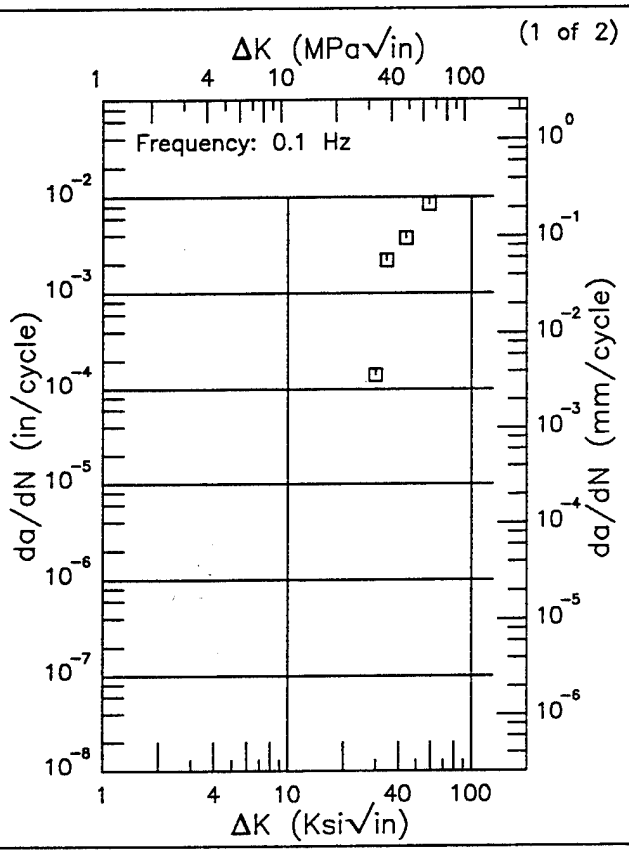
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.	27.00	0. .5 .8 1.25 2.

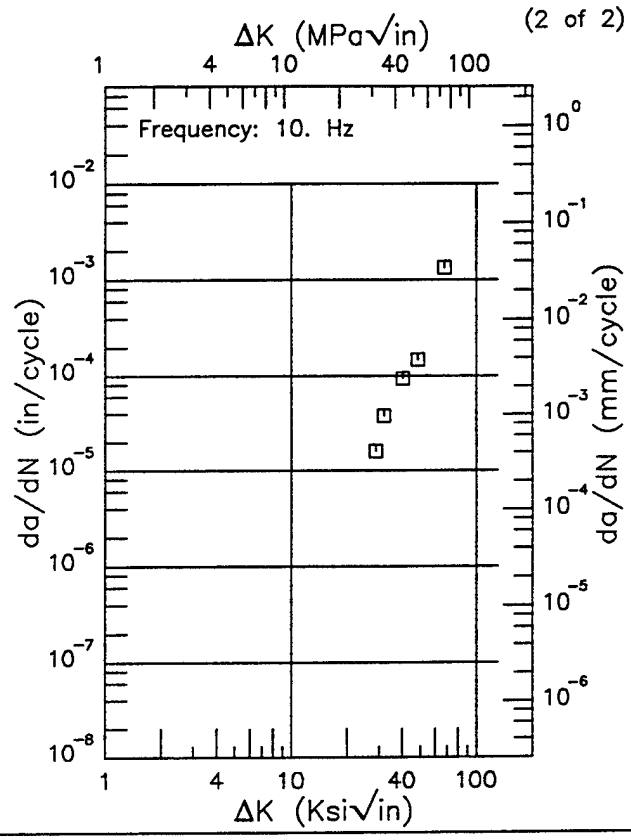
Figure 6.16.3.1.130

Ti–6Al–4V F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: 3.5% NACL;175°F

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

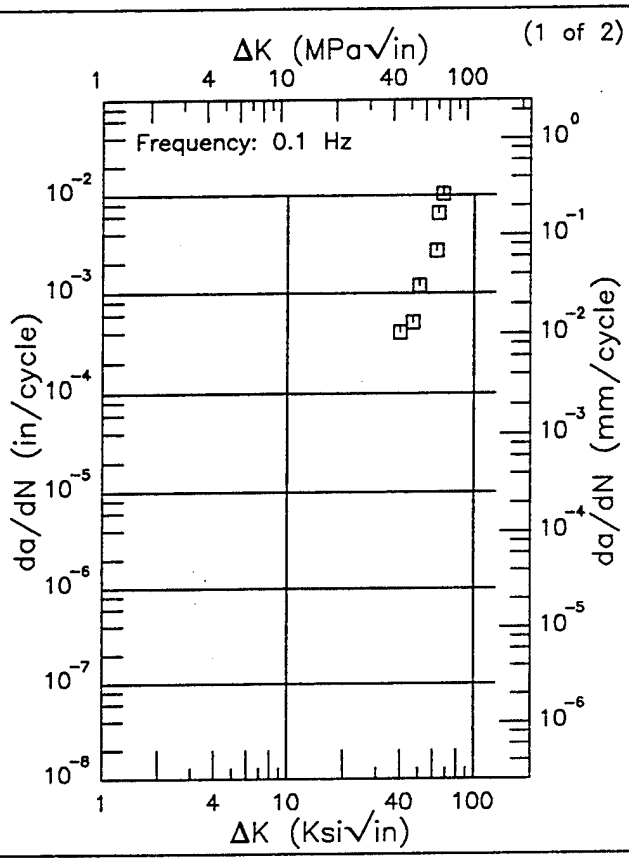
Figure 6.16.3.1.131

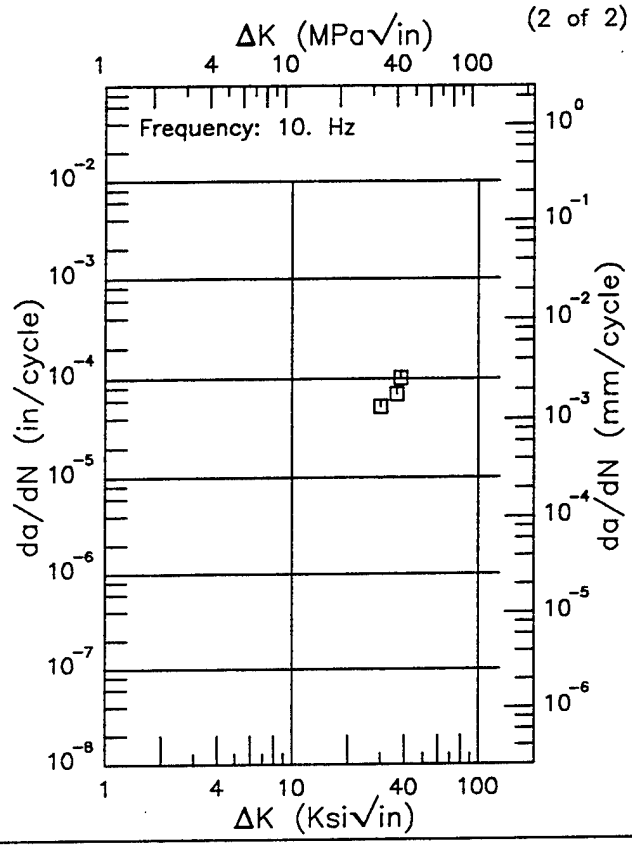
Ti–6Al–4V

F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: DIST WATER;175°F

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

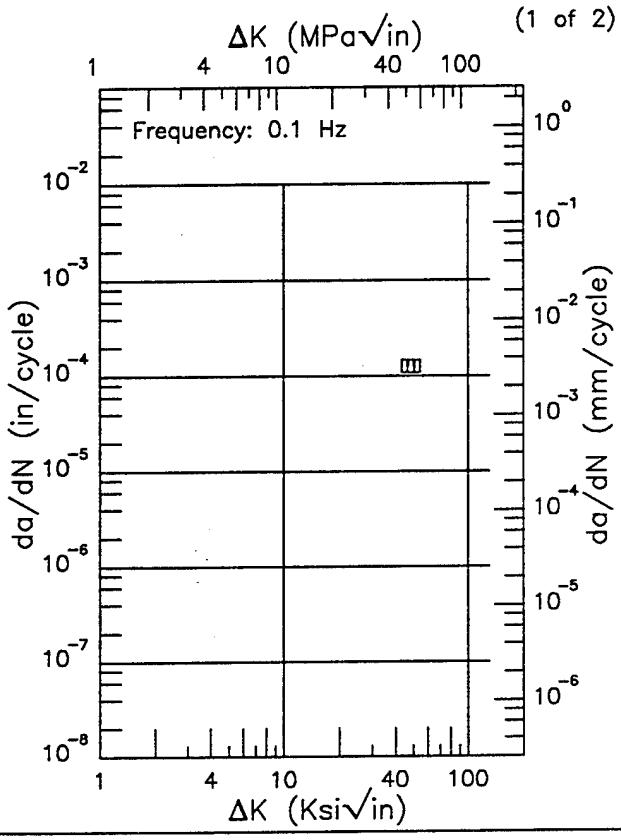
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

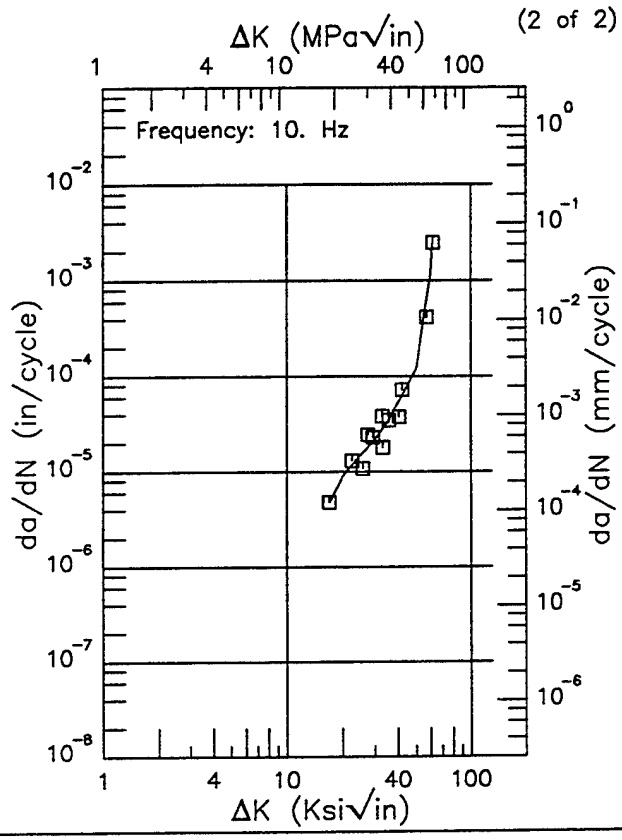
Figure 6.16.3.1.132

Ti–6Al–4V F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (HAZ)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR;175°F

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
16.93 (min)	4.81
20.	9.03
25.	15.0
30.	21.6
35.	33.1
40.	52.5
50.	119.
60.	1183.
61.62 (max)	2391.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
25.08	0. .5 .8 1.25 2.

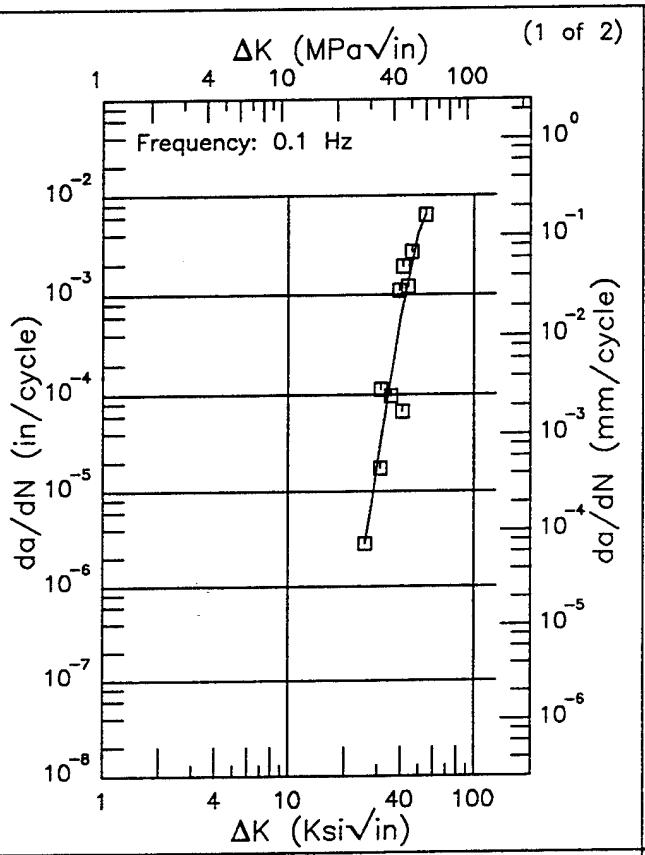
Figure 6.16.3.1.133

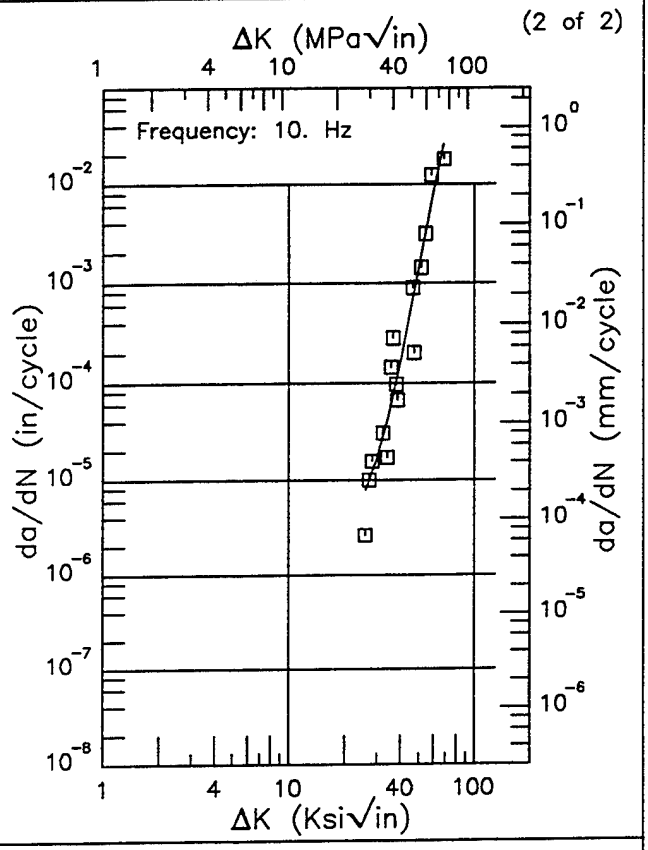
Ti–6Al–4V

F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: DIST WATER; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.76 (min)	2.92
30.	18.7
35.	127.
40.	588.
50.	4116.
54.73 (max)	6497.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
25.83 (min)	7.92
30.	16.5
35.	49.9
40.	160.
50.	1394.
60.	8242.
68.14 (max)	25779.

RMS % Error	Life Prediction Ratio Summary
>100.0	0. .5 .8 1.25 2.

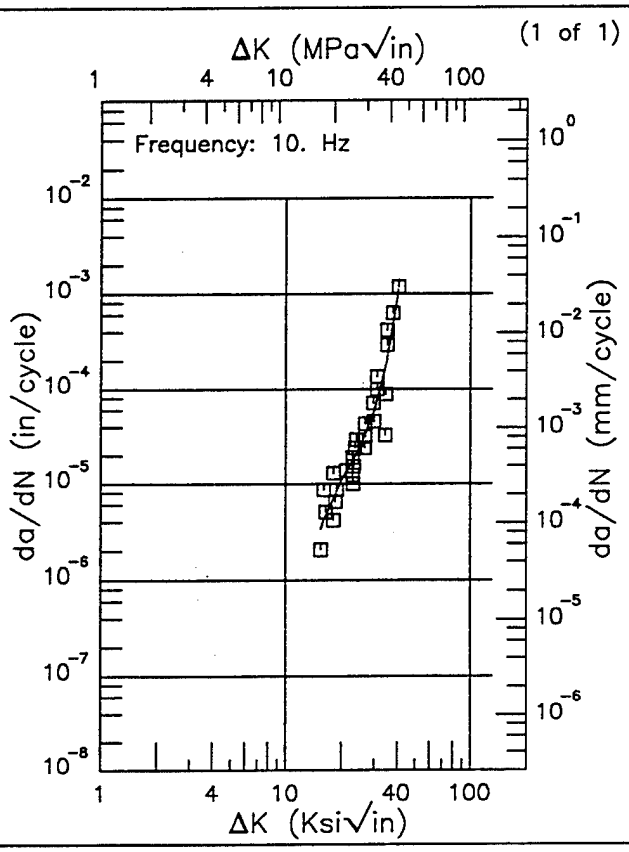
RMS % Error	Life Prediction Ratio Summary
94.42	0. .5 .8 1.25 2.

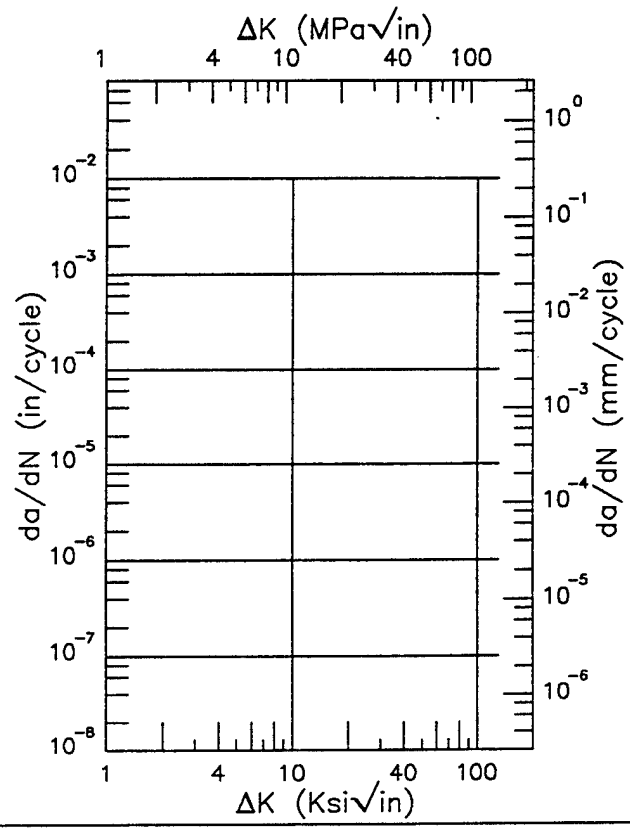
Figure 6.16.3.1.134

Ti–6Al–4V F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.48 (min)	3.36
16.	4.10
20.	10.9
25.	23.8
30.	58.6
35.	197.
40.	925.
40.52 (max)	1107.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
45.50	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

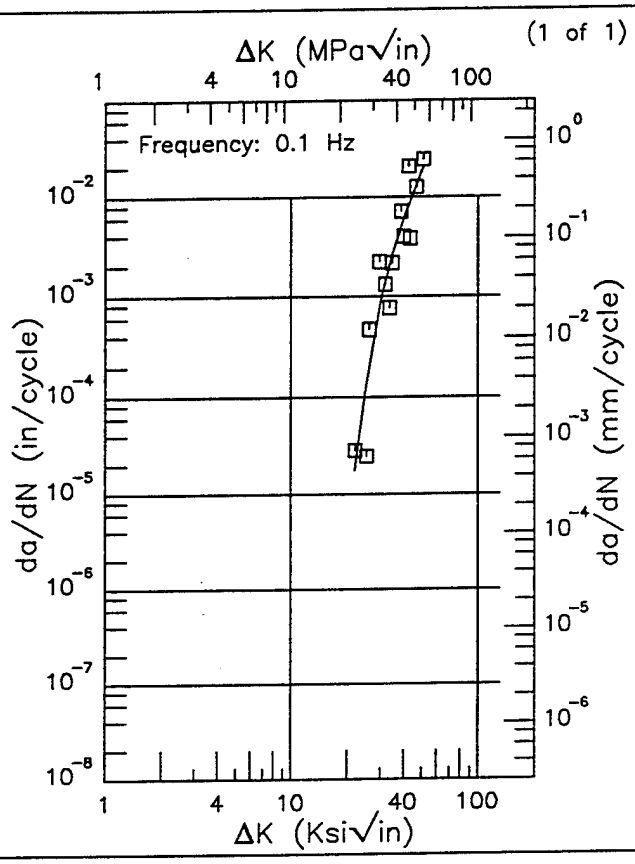
Figure 6.16.3.1.135

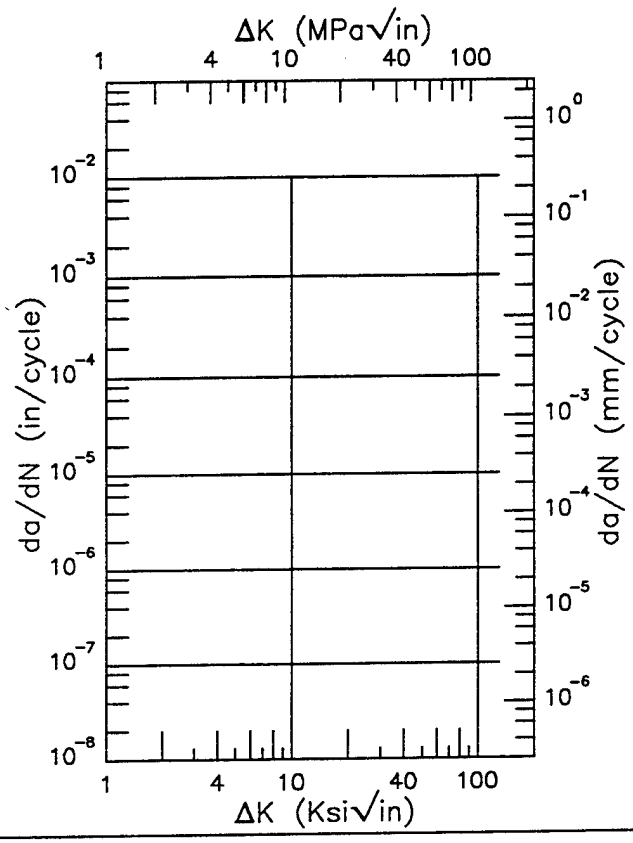
Ti–6Al–4V

F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: 3.5% NACL; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.95 (min)	17.8
25.	120.
30.	854.
35.	2746.
40.	5987.
50.	18134.
51.09 (max)	20210.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
89.10	0. .5 .8 1.25 2.

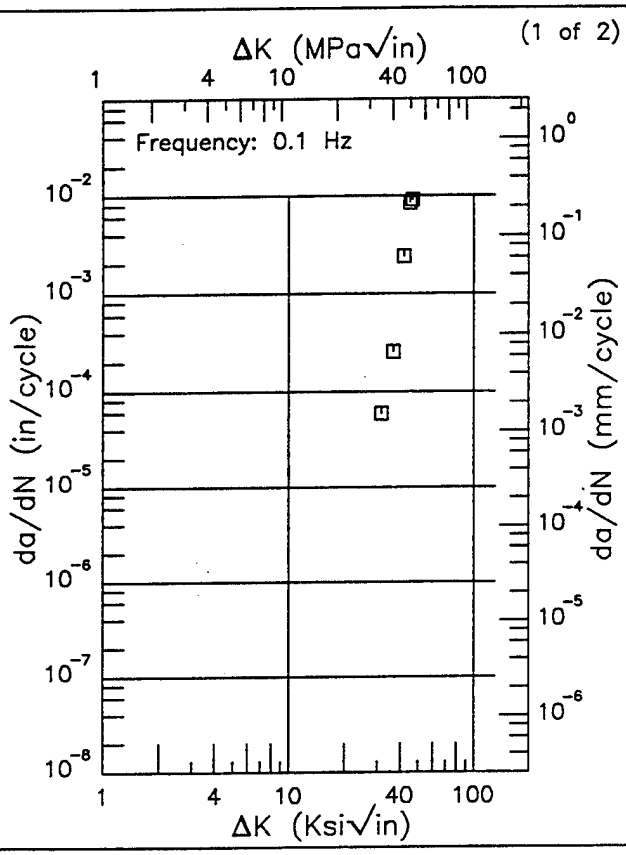
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

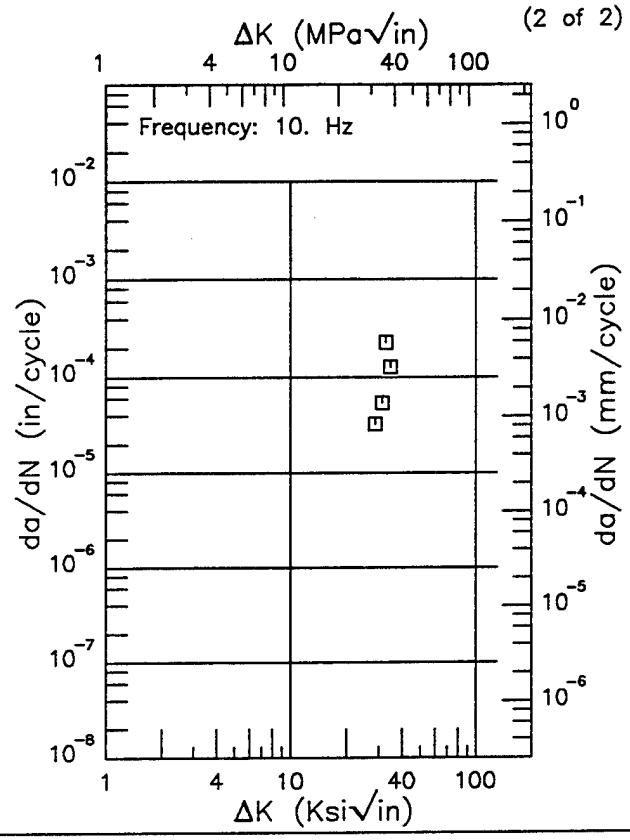
Figure 6.16.3.1.136

Ti–6Al–4V F

Condition/Ht: STRESS RELIEVED E.B. WELDMENT (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: 3.5% NACL;175°F

Yield Strength:
Ult. Strength:
Specimen Thk: 1 in.
Specimen Width: 2.55 in.
Ref: 88144





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

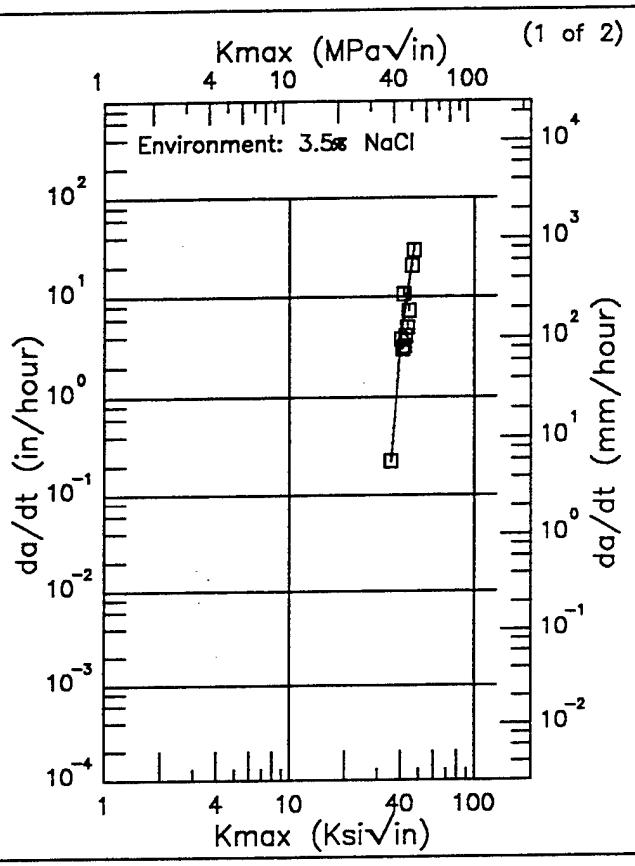
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

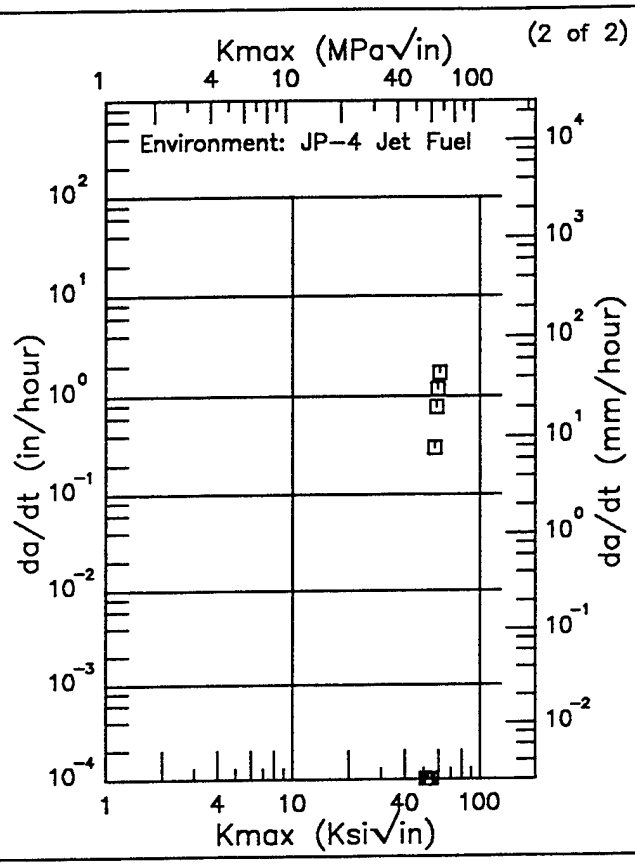
Figure 6.16.3.1.137

Ti–6Al–4V

Condition/Ht: 1000F 2HR
Form: 2 in. Forging
Specimen Type: TDCB
Orientation: L–T
Yield Strength: 145 ksi
Ult. Strength:

Specimen Thk: 1.25 in.
Specimen Width: 5.5 in.
Ao:
K_{Iscc}: 31 – 43 ksi
Ref: 84360





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
35.60 (min)	222.
40.	4001.
47.00 (max)	28004.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
41.5	

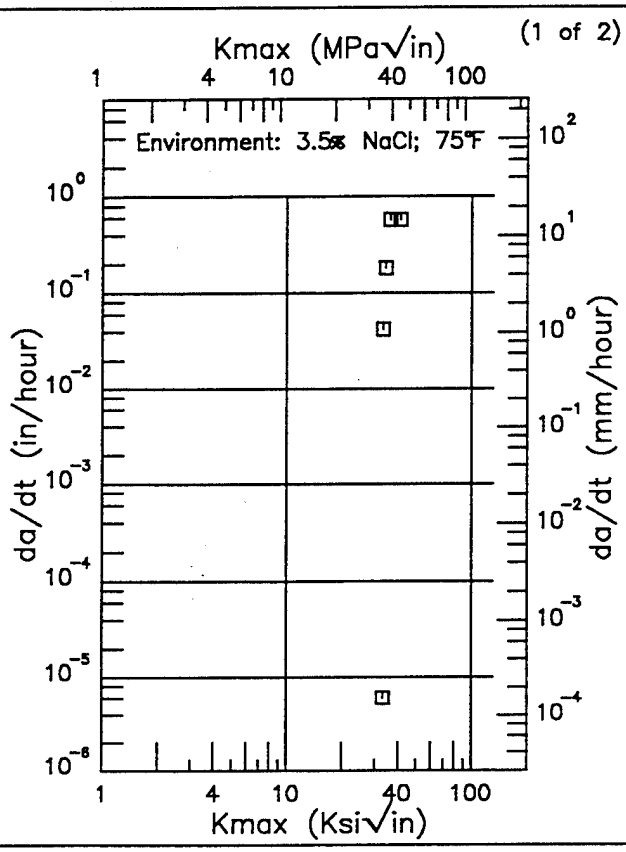
RMS % Error	

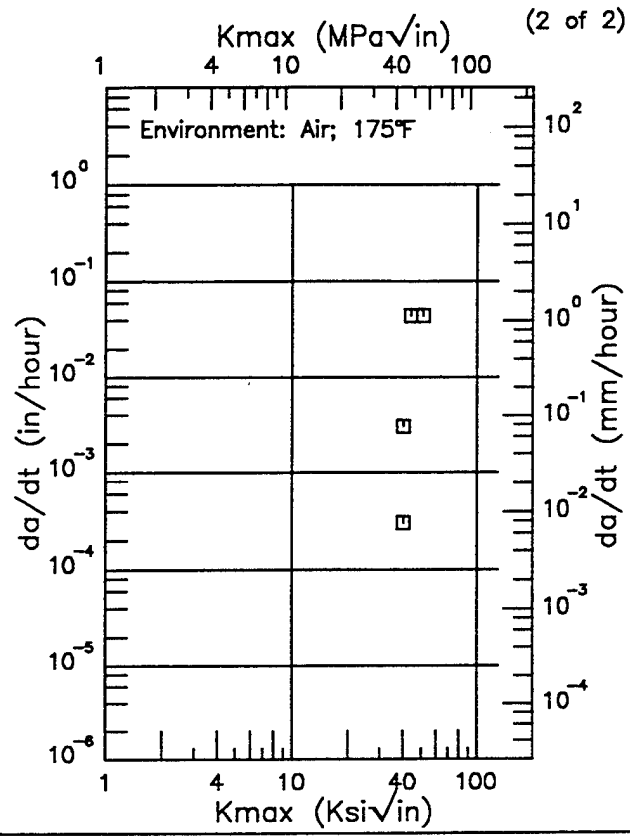
Figure 6.16.3.2.1

Ti–6Al–4V

Condition/Ht: EB WELD STRESS RELIEVED (HEAT AFFECTED ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Yield Strength: 132 ksi
Ult. Strength:

Specimen Thk: 1 in.
Specimen Width: 2.55 in.
A_O:
K_{Iscc}: 33 ksi
Ref: 88144





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)	Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

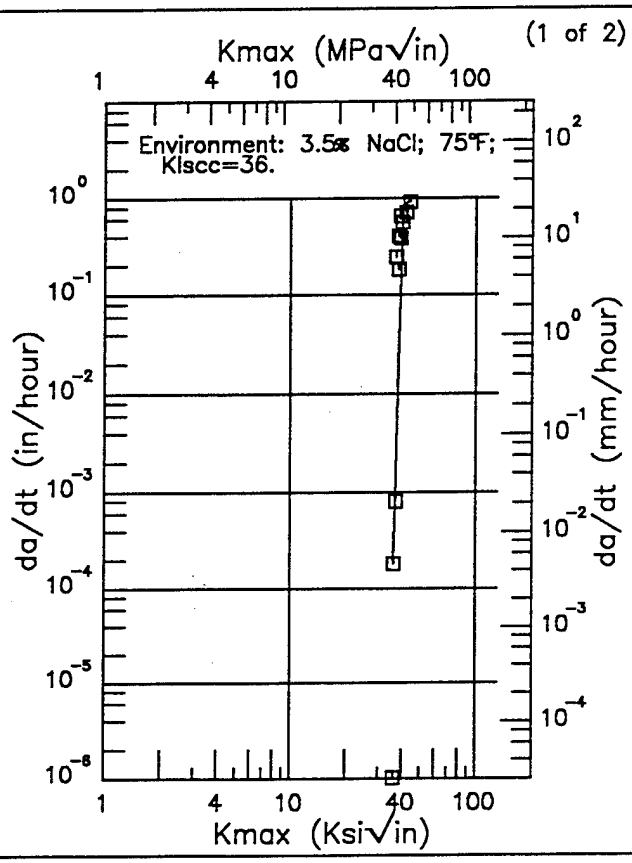
RMS % Error		RMS % Error	

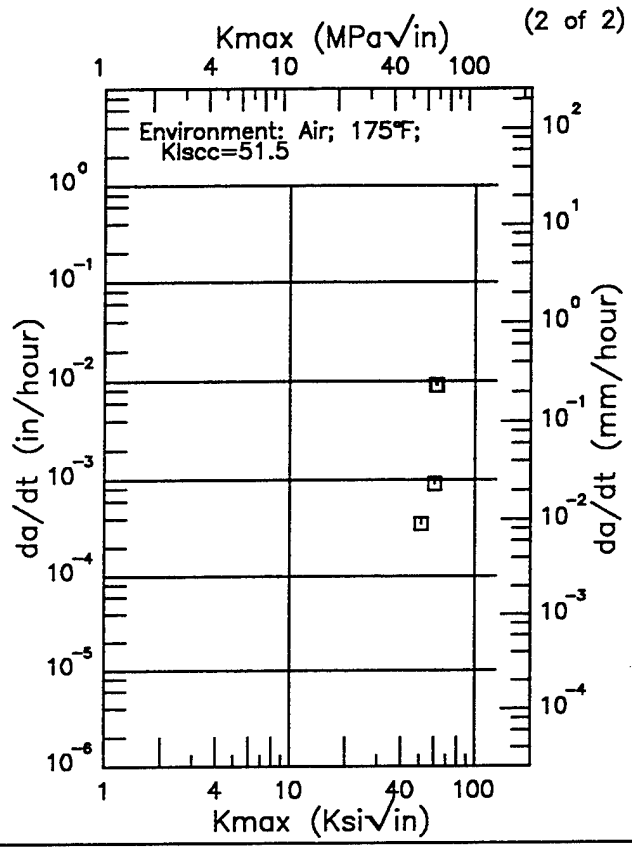
Figure 6.16.3.2.2

Ti–6Al–4V

Condition/Ht: EB WELD STRESS RELIEVED (WELD ZONE)
Form: Weldment
Specimen Type: CT
Orientation: T–L
Yield Strength: 132 ksi
Ult. Strength:

Specimen Thk: 1 in.
Specimen Width: 2.55 in.
A_O:
K_{Iscc}: 36 – 51.5 ksi
Ref: 88144





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
36.00 (min)	0.197
40.	764.
44.00 (max)	1001.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
>100.0	

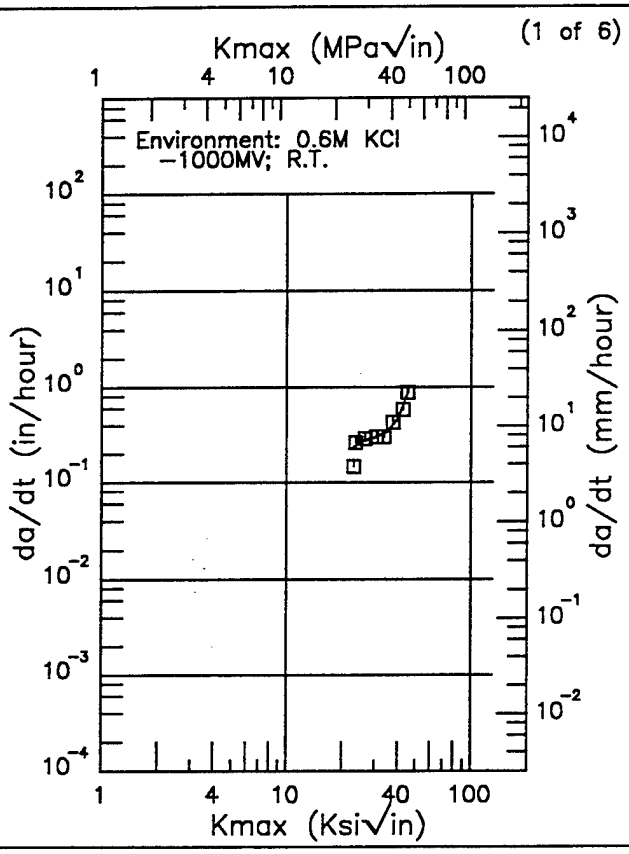
RMS % Error	

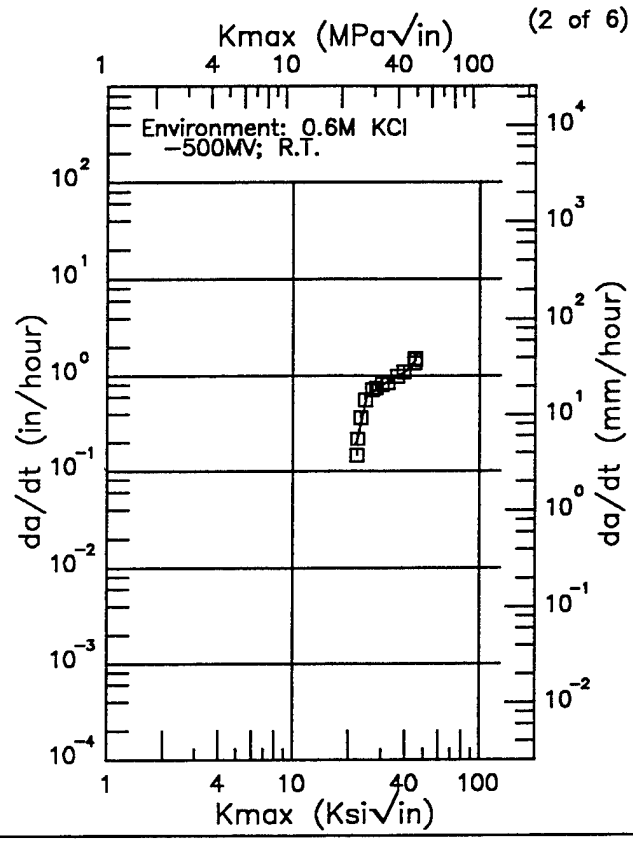
Figure 6.16.3.2.3

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 81221





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
23.00 (min)	232.
25.	266.
30.	299.
35.	341.
40.	474.
45.20 (max)	867.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
22.00 (min)	194.
25.	608.
30.	778.
35.	949.
40.	1096.
45.20 (max)	1447.

RMS % Error	
13.71	

RMS % Error	
10.48	

Figure 6.16.3.2.4

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 81221

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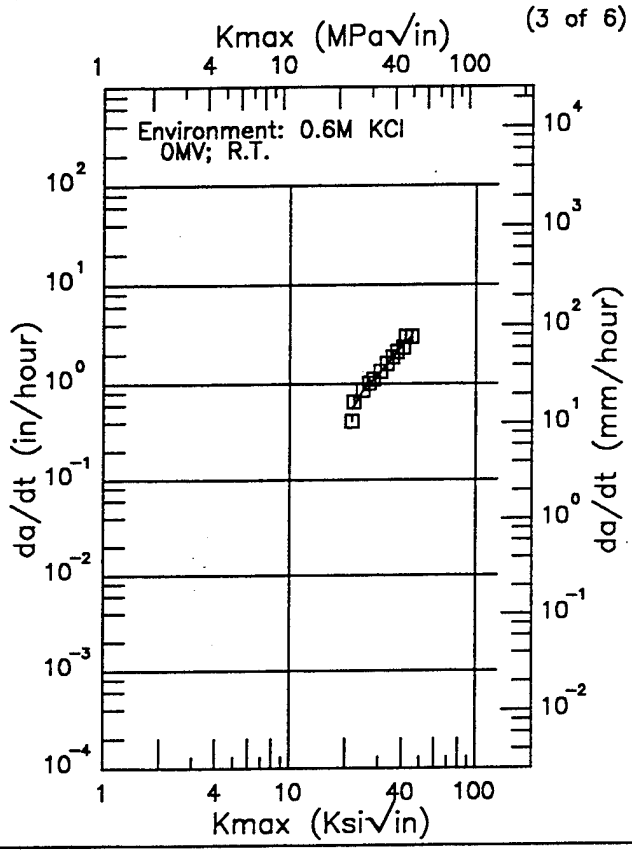
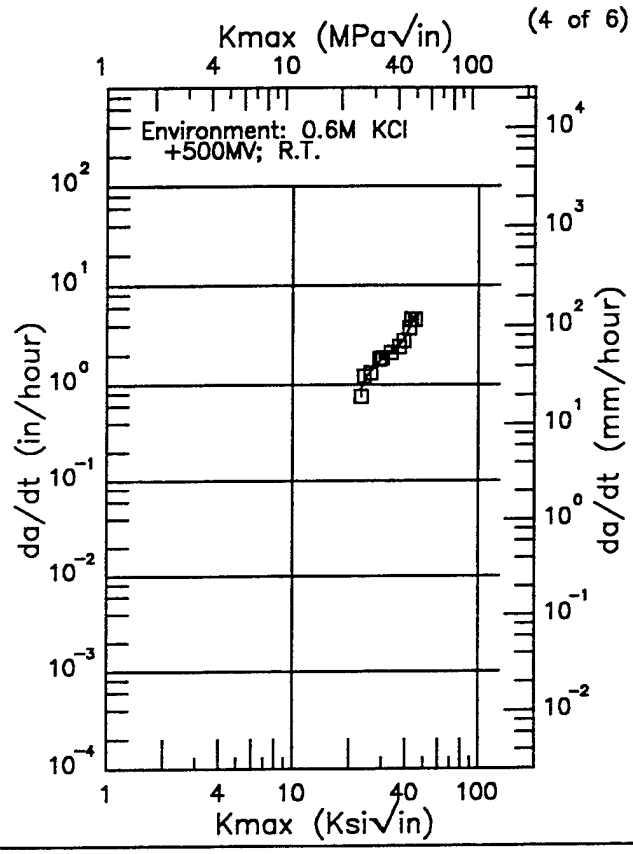


Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
21.50 (min)	549.
25.	898.
30.	1264.
35.	1785.
40.	2470.
45.00 (max)	3072.

RMS % Error
8.74

(4 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
23.00 (min)	882.
25.	1236.
30.	1823.
35.	2242.
40.	3027.
45.20 (max)	5110.

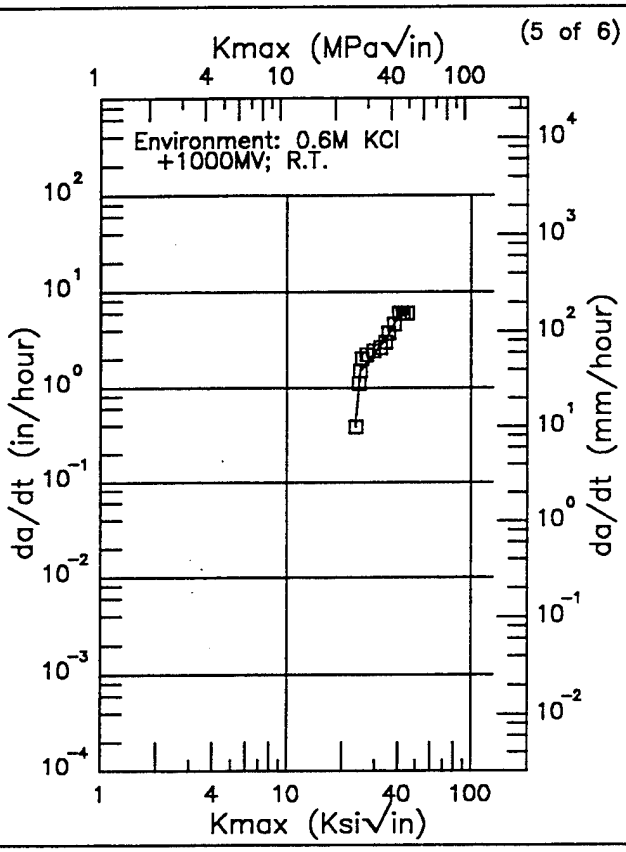
RMS % Error
8.28

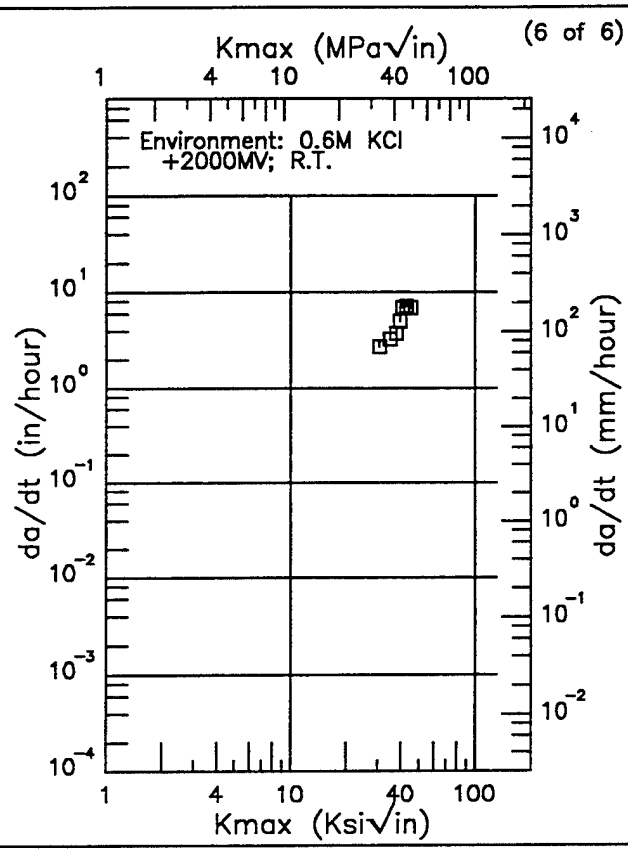
Figure 6.16.3.2.4 (Continued)

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 81221





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
23.50 (min)	403.
25.	1509.
30.	2319.
35.	3450.
40.	5550.
45.00 (max)	5949.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
12.02	

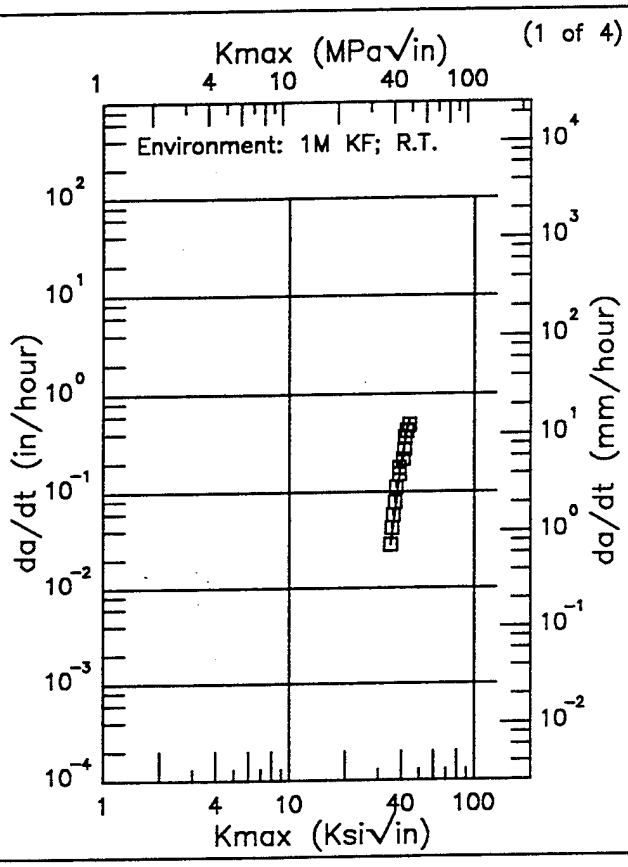
RMS % Error	

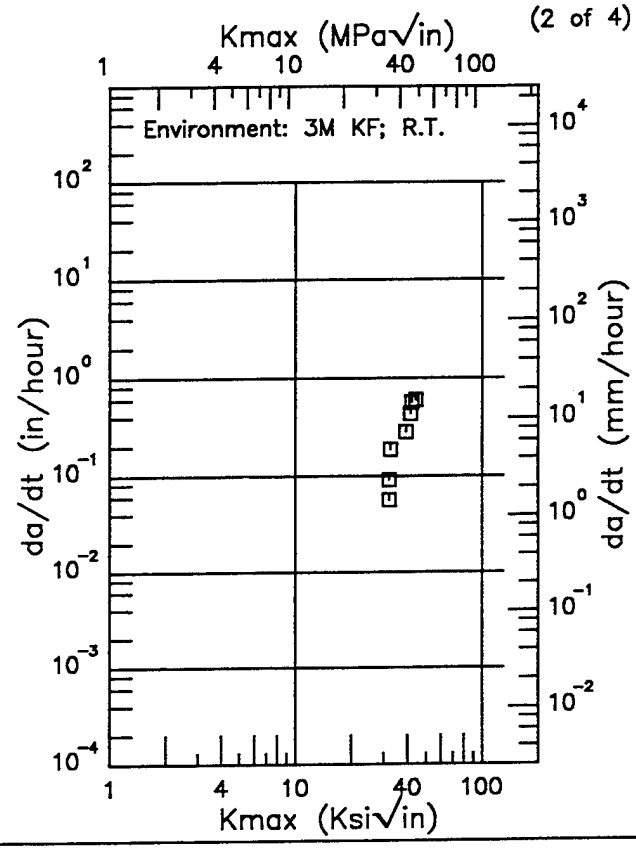
Figure 6.16.3.2.4 (Concluded)

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}: 35 ksi
Ref: 81221





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
35.00 (min)	30.0
40.	207.
44.20 (max)	529.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
18.	

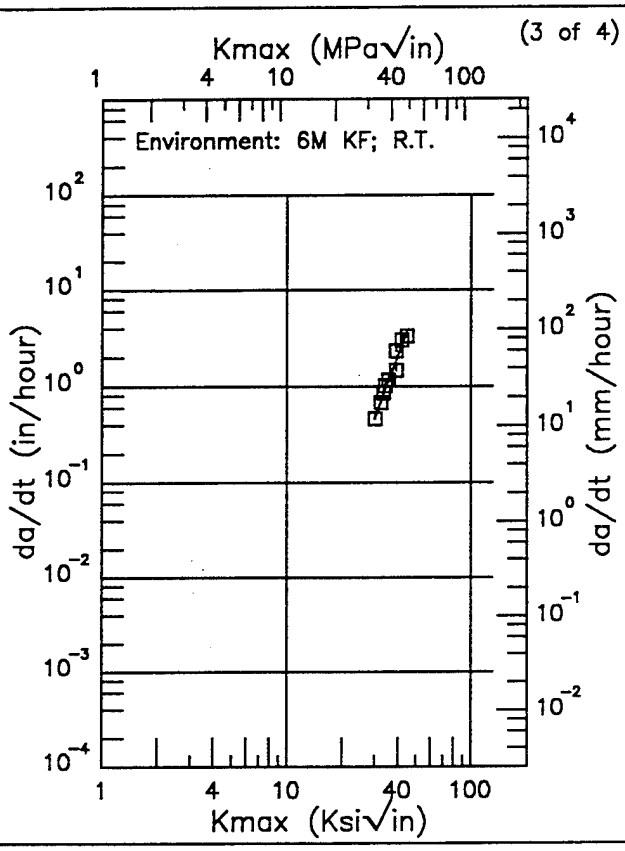
RMS % Error	

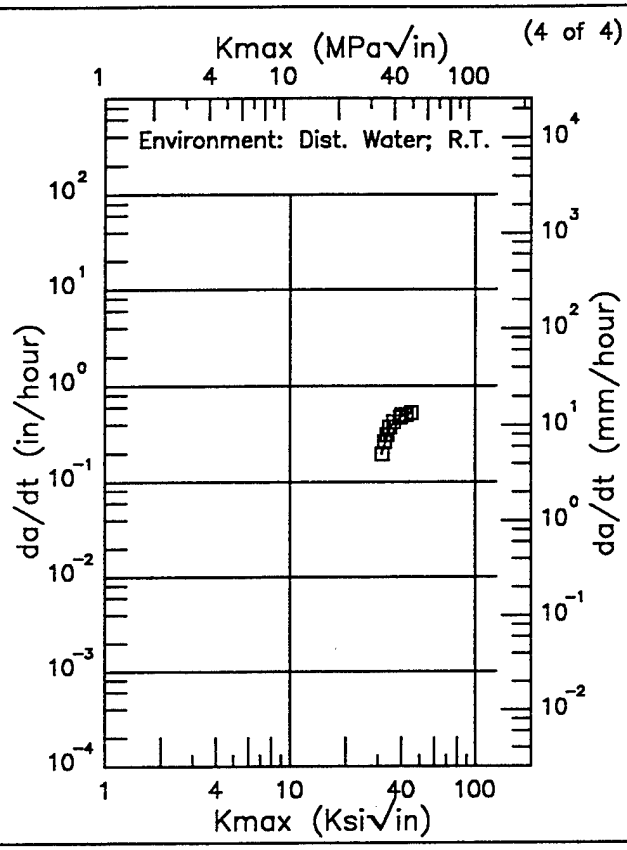
Figure 6.16.3.2.5

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}: 35 ksi
Ref: 81221





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
30.00 (min)	461.
35.	1075.
40.	2121.
44.50 (max)	3590.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
31.40 (min)	196.
35.	381.
40.	485.
45.00 (max)	522.

RMS % Error 11.91

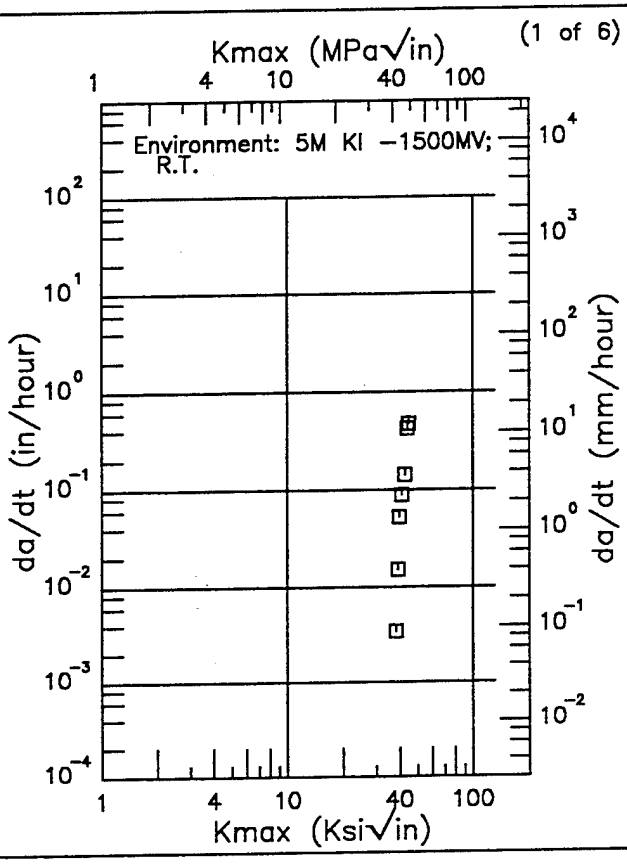
RMS % Error 3.87

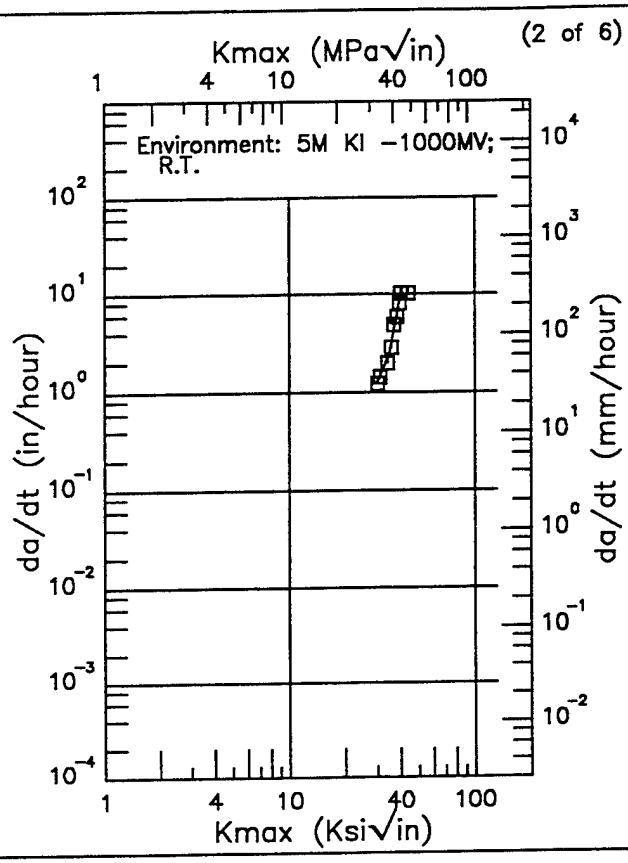
Figure 6.16.3.2.5 (Concluded)

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 81221





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
30.00 (min)	1237.
35.	2496.
40.	9603.
44.00 (max)	10002.

RMS % Error	

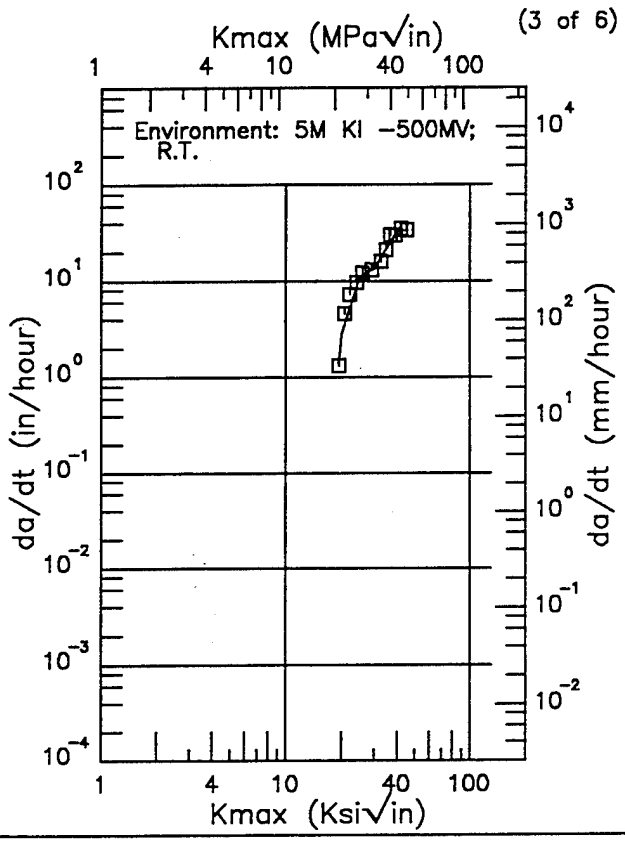
RMS % Error	
7.12	

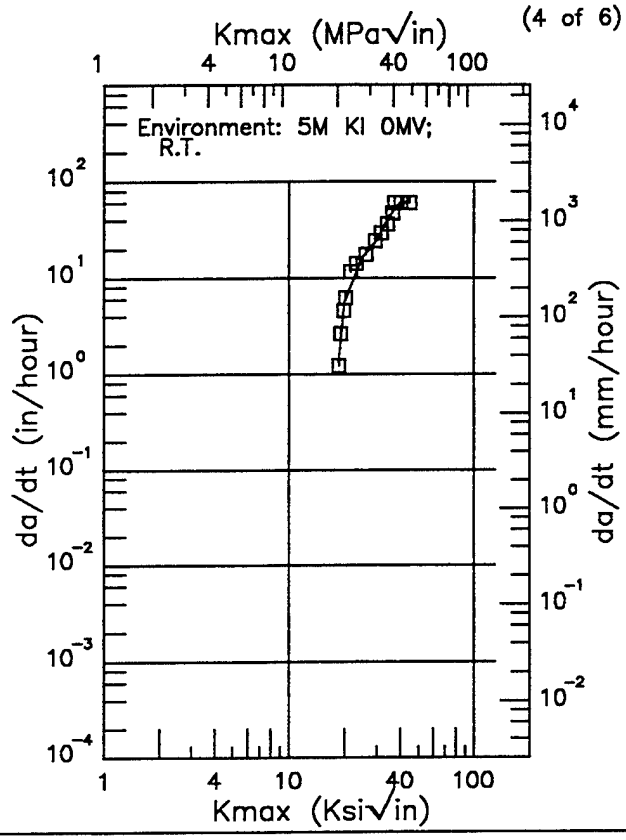
Figure 6.16.3.2.6

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 81221





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
19.20 (min)	1390.
20.	2779.
25.	11081.
30.	13644.
35.	22181.
40.	33262.
44.70 (max)	33578.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
18.50 (min)	1355.
20.	5587.
25.	16341.
30.	24942.
35.	44033.
40.	61104.
44.80 (max)	59957.

RMS % Error 17.77

RMS % Error 15.94

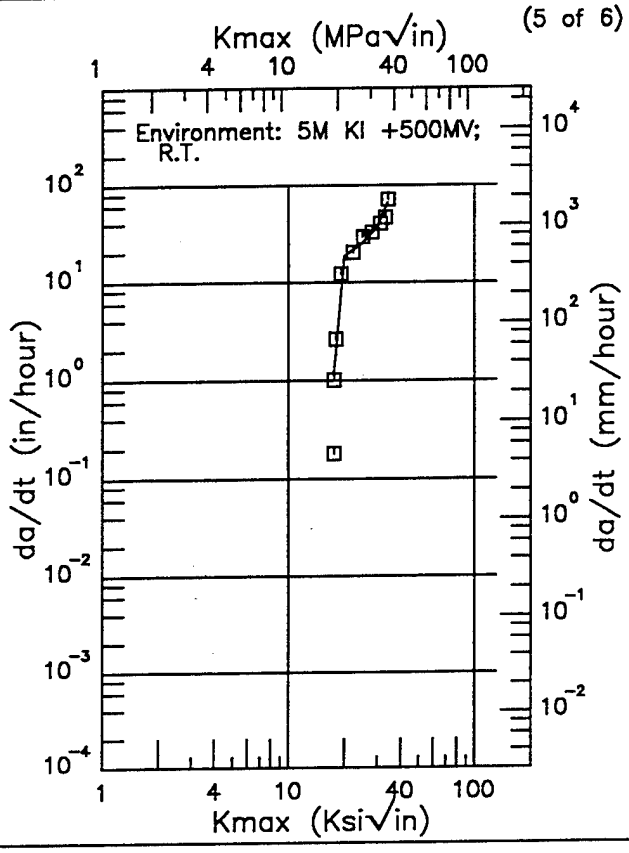
Figure 6.16.3.2.6 (Continued)

Ti–6Al–4V

Condition/Ht: MA
Form: 0.2 in. Sheet
Specimen Type: DCB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.2 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 81221

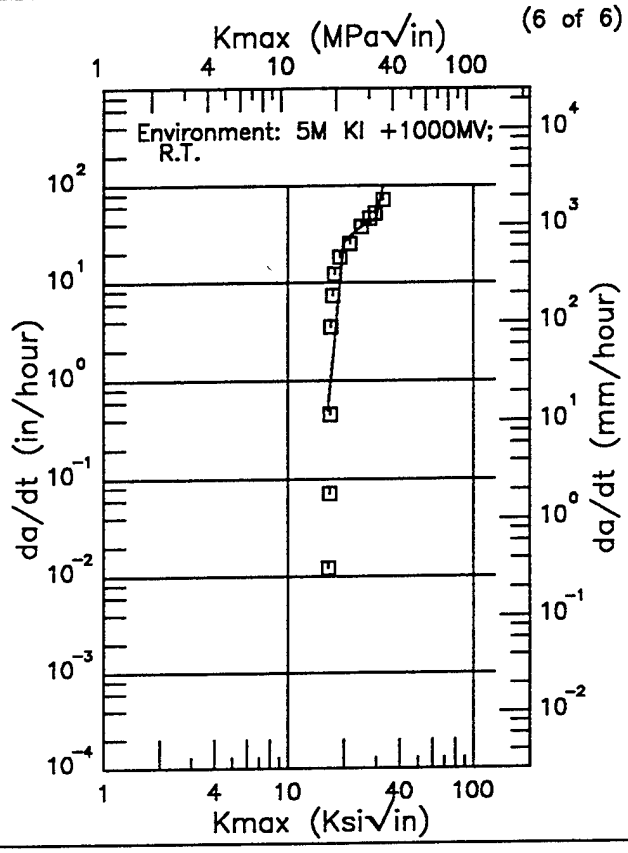
(5 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
17.50 (min)	1161.
20.	18558.
25.	25355.
30.	36711.
34.00 (max)	66053.

RMS % Error
37.84

(6 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
16.50 (min)	503.
20.	25954.
25.	37810.
30.	45074.
32.50 (max)	98475.

RMS % Error
>100.0

Figure 6.16.3.2.6 (Concluded)

TABLE 6.16.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
1300°F 2hr AC	E	R.T.	L-S	121.2	3.5% NaCl	NB	1.5	0.48	0.5	---	94.7	65+	---	1972	84282
			L-T	128.9	3.5% NaCl	NB	1.5	0.48	0.5	---	83.3	73+	---	1972	84282
1700°F 4hr FC to 1400°F AC; Diffusion Bond Thermal Cycle	P	R.T.	L-T	---	S.T.W.	DCB	5.5	1	1.5	---	---	---+	---	1974	89004
						DCB	5.5	1	1.5	---	---	66+	---	1974	89004
			T-L	---	Field Cleaning Solvent	DCB	5.5	1	1.5	---	94	70+	---	1974	89004
					S.T.W.	DCB	5.5	1	1.5	---	94	61+	---	1974	89004
						DCB	5.5	1	1.5	---	---	60+	---	1974	89004
						DCB	5.5	1	1.5	---	92	44+	---	1974	89004
						DCB	5.5	1	2	---	92	58+	---	1974	89004
						DCB	5.5	1	2	---	92	53+	---	1974	89004
					Shop Cleaning Solvent	DCB	5.5	1	1.5	---	94	69+	---	1974	89004
1725°F 1hr WQ; 1000°F 1hr AC; (STA)	E	R.T.	L-S	145.7	3.5% NaCl	NB	1.5	0.48	0.5	---	67.2	51	---	1972	84282
				146.9	3.5% NaCl	NB	1.5	0.48	0.5	---	65.8	46	---	1972	84282
1725°F 1hr WQ; 1250°F 4hr AC; (STOA)	E	R.T.	L-S	139.4	3.5% NaCl	NB	1.5	0.48	0.5	---	77.8	60	---	1972	84282
				140.3	3.5% NaCl	NB	1.5	0.48	0.5	---	74.9	70+	---	1972	84282

TABLE 6.16.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
1750°F 1.5hr WQ; 1050°F-1100°F 8hr; 950°F 8hr	F	R.T.	---	160.9	Aerozine 50	PTSC	0.8	0.095	---	---	52.2	37+	---	1969	75528
					Freon TF	PTSC	0.8	0.095	---	---	52.2	39+	---	1969	75528
					N_2O_4	PTSC	0.8	0.095	---	---	52.2	40+	---	1969	75528
				161.4	Aerozine 50	PTSC	0.8	0.095	---	---	51.5	38+	---	1969	75528
					Freon TF	PTSC	0.8	0.095	---	---	51.5	42+	---	1969	75528
					N_2O_4	PTSC	0.8	0.095	---	---	51.5	41+	---	1969	75528
1750°F; 1000°F 2hr AC	F	R.T.	L-T	144.9	3.5% NaCl	TDCB	5	1.25	2.3	---	50.9	31	---	1971	84360
					JP-4 Fuel	TDCB	5	1.25	2.3	---	50.9	43.3	---	1971	84360
1750°F WQ; 1000°F 8hr 1000°F; (Alpha+Beta)	F	R.T.	---	160	Dist Water +500	PTSC	1	0.03	0.5	---	43.5	40+	---	1968	77290
					Methanol	PTSC	1	0.06	0.5	---	45.9	>26+	---	1968	77290
						PTSC	1	0.03	0.5	---	43.5	<26+	---	1968	77290
					PPM $Na_2Cr_2O_7$	PTSC	1	0.06	0.5	---	45.9	43+	---	1968	77290
1790°F 1.5hr WQ; 1160°F 8hr + 1025°F 8hr AC	S	R.T.	---	---	Martin-Marietta Refined Grade Hydrazine	WOL	1.3	0.125	1.25	---	---	46.2+	---	1974	88700
					Propellant Grade Hydrazine	WOL	1.3	0.125	1.25	---	---	64.3+	---	1974	88700

TABLE 6.16.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
Alpha-Beta Forged	F	R.T.	T-L	144.9	3.5% NaCl	CT	2	1	2.25	---	36.5	27	---	1973	86688
					Industrial Atm	CT	2	1	2.25	---	36.5	27	---	1973	86688
					Seacoast Atm	CT	2	1	2.25	---	36.5	18	---	1973	86688
Beta Forged	F	R.T.	T-L	134.9	3.5% NaCl	CT	2	1	2.25	---	44.2	34	---	1973	86688
					Industrial Atm	CT	2	1	2.25	---	44.2	42	---	1973	86688
					Seacoast Atm	CT	2	1	2.25	---	44.2	42	---	1973	86688
Finish Rolled 1440°F	P	R.T.	T-S	114	3.5% NaCl	NB*	3	1.5	3	1.05	---	74.5	---	1972	84036
						NB*	3	1.5	3	1.11	---	79.6	---	1972	84036
						NB*	2	0.75	3	1.15	116	94.6+	---	1972	84036
						NB*	2	0.75	3	1.17	116	90.1+	---	1972	84036
						NB*	2	0.75	3	1.22	116	95+	---	1972	84036
						NB*	2	0.75	3	0.3	116	96+	---	1972	84036
						NB*	3	1.5	3	1.04	---	78.6	---	1972	84036
						NB*	3	2	3	0.92	---	61.5	---	1972	84036
						NB*	3	2	3	1	---	78	---	1972	84036
						NB*	3	1.5	3	1.16	---	87.2	---	1972	84036
						NB*	3	2	3	0.96	---	73.7	---	1972	84036

TABLE 6.16.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
GTA Weld; Postweld 1100°F 2hr (Heat Affected Zone)	P	R.T.	L-T	---	Field Cleaning Solvent	DCB	5.5	0.5	1.25	---	---	>48⁺	---	1974	89004
					Shop Cleaning Solvent	DCB	5.5	0.5	1.25	---	---	>64⁺	---	1974	89004
GTA Weld; Postweld 1100°F 2hr (Weld Zone)	P	R.T.	L-T	---	S.T.W.	DCB	5.5	0.5	1.25	---	---	93⁺	---	1974	89004
GTA Weld; Postweld 1100°F 2hr (Heat Affected Zone)	P	R.T.	L-T	---	S.T.W.	DCB	5.5	0.75	1.25	---	---	76⁺	---	1974	89004
						DCB	5.5	0.5	1.25	---	---	>89⁺	---	1974	89004
						DCB	5.5	1	1.25	---	---	58⁺	---	1974	89004
GTA Weld; Postweld 1200°F 1hr (Heat Affected Zone)	P	R.T.	L-T	---	S.T.W.	DCB	5.5	0.125	1.25	---	---	>67⁺	---	1974	89004
						DCB	5.5	0.25	1.25	---	---	>66⁺	---	1974	89004
GTA Weld; Postweld 1400°F 1hr (Heat Affected Zone)	P	R.T.	L-T	---	S.T.W.	DCB	5.5	0.125	1.25	---	---	>62⁺	---	1974	89004
						DCB	5.5	0.25	1.25	---	---	>70⁺	---	1974	89004
As Received; Probably Mill Annealed	P	R.T.	T-S	125	3.5% NaCl	CANT*	---	---	---	---	120	105⁺	---	1968	74355

TABLE 6.16.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
Mill Annealed	S	R.T.	---	---	A-50	WOL	1.3	0.125	0.13	---	---	68+	---	1974	88700
					MCB	WOL	1.3	0.125	0.13	---	---	38.6+	---	1974	88700
					MCB/1% CO_2	WOL	1.3	0.125	0.13	---	---	40.8+	---	1974	88700
			T-L	---	1 M KF	DCB	---	0.2	0.2	---	---	35+	---	1971	81221
					3 M KF	DCB	---	0.2	0.2	---	---	37+	---	1971	81221
					6 M KF	DCB	---	0.2	0.2	---	---	31+	---	1971	81221
					6M KF -1500MV	DCB	---	0.2	0.2	---	---	38+	---	1971	81221
					6M KF -1000MV	DCB	---	0.2	0.2	---	---	31+	---	1971	81221
					6M KF -500MV	DCB	---	0.2	0.2	---	---	20+	---	1971	81221
					6M KF 0 MV	DCB	---	0.2	0.2	---	---	19+	---	1971	81221
					6M KF +1000MV	DCB	---	0.2	0.2	---	---	16+	---	1971	81221
					6M KF +500MV	DCB	---	0.2	0.2	---	---	17+	---	1971	81221
					Dist. Water	DCB	---	0.2	0.2	---	---	33+	---	1971	81221
	P	R.T.	L-S	---	3.5% NaCl	NB	---	---	0.5	---	61	32+	---	1969	75386
			T-S	120	3.5% NaCl	CANT*	1	0.75	1	---	88	67+	---	1967	70931
Minuteman Casing	P	R.T.	T-S	165	3.5% NaCl	CANT	0.75	0.1	---	---	64	55+	---	1967	70931

TABLE 6.16.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
Recrystallize Anneal	P	R.T.	L-T	117	S.T.W.	DCB	5.5	1	1.5	---	74	60	60300	1976	RI006
						DCB	5.5	1	1.5	---	74	60	60300	1976	RI006
						DCB	5.5	1	1.5	---	74	55	54360	1976	RI006
						DCB	5.5	1	1.5	---	74	>69	60300	1976	RI006
				121	S.T.W.	DCB	5.5	1	1.5	---	76	63	54360	1976	RI006
						DCB	5.5	1	1.5	---	76	>67	54360	1976	RI006
						DCB	5.5	1	1.5	---	76	>69	54360	1976	RI006
						DCB	5.5	1	1.5	---	76	62	51720	1976	RI006
				122	S.T.W.	DCB	5.5	1	2.5	---	77	56	70140	1976	RI006
						DCB	5.5	1	2.5	---	77	60	54360	1976	RI006
						DCB	5.5	1	2.5	---	77	60	54360	1976	RI006
						DCB	5.5	1	2.5	---	77	59	70140	1976	RI006
			T-L	122	F.C.S.	DCB	5.5	1	1.5	---	77	70	119100	1976	RI006
					S.C.S.	DCB	5.5	1	1.5	---	77	63	112200	1976	RI006
						DCB	5.5	1	1.5	---	77	75	59100	1976	RI006
					S.T.W.	DCB	5.5	1	1.5	---	77	62	54360	1976	RI006
						DCB	5.5	1	1.5	---	77	61	60300	1976	RI006
						DCB	5.5	1	1.5	---	77	62	60300	1976	RI006

TABLE 6.16.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
Recrystallize Anneal (cont'd)	P (cont'd)	R.T. (cont'd)	T-L (cont'd)	122 (cont'd)	S.T.W. (cont'd)	DCB	5.5	1	1.5	---	77	58	60300	1976	RI006
				126	S.T.W.	DCB	5.5	1	2	---	80	55	61980	1976	RI006
						DCB	5.5	1	2	---	80	61	61980	1976	RI006
	F	R.T.	T-L	119	S.T.W.	DCB	5.5	1	4	---	75	51	60360	1976	RI006
						DCB	5.5	1	4	---	75	55	60360	1976	RI006
			S-L	---	S.T.W.	DCB	5.5	1	---	---	75	56+	60180	1976	RI006
						DCB	5.5	1	---	---	78	>57+	64920	1976	RI006
						DCB	5.5	1	---	---	78	>71+	60660	1976	RI006
						DCB	5.5	1	---	---	75	56+	60660	1976	RI006
				125	S.T.W.	DCB	5.5	1	4	---	79	57	61680	1976	RI006
						DCB	5.5	1	4	---	79	55	64920	1976	RI006
SOL Treated 1050°F 4+4 hr	F	85	---	160	N_2O_4 315PSIG	PTSC	1	0.052	---	0.02	45	28+	---	1969	78535
				161	N_2O_4 315PSIG	PTSC	1	0.052	---	0.02	45	30+	---	1969	78535
SOL Treated 1050°F 4hr; Welded 1050°F 4hr	F	85	---	133	N_2O_4 315PSIG	PTSC	1.5	0.062	---	0.03	47	32+	---	1969	78535
				138	N_2O_4 315PSIG	PTSC	1.5	0.062	---	0.03	47	31+	---	1969	78535
Unspecified	---	R.T.	L-T	116	3.5% NaCl	CANT	---	---	---	---	115	95+	---	1967	70887

TABLE 6.16.3.3 (CONCLUDED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
Unspecified	F	R.T.	---	105	3.5% NaCl	CANT	1.1	0.75	---	---	98	80*	---	1968	84328
					Methanol	CANT	1.1	0.75	---	---	98	60+	---	1968	84328
					N-Hexane	CANT	1.1	0.75	---	---	98	80*	---	1968	84328
Unspecified	F	R.T.	S-T	106	JP-4 Fuel	BWOL	3.075	1.249	1.25	1.37	---	>66.5	133920	1977	MA005
						BWOL	3.073	1.251	1.25	1.36	---	>66.6	133920	1977	MA005
					Sim. Sea Water	BWOL	3.077	1.249	1.25	1.62	---	>69.6	133920	1977	MA005
						BWOL	3.077	1.25	1.25	1.37	---	>69.3	133920	1977	MA005
				108	JP-4 Fuel	BWOL	3.078	1.251	1.25	1.38	---	>69	133920	1977	MA005
						BWOL	3.078	1.252	1.25	1.36	---	>68	133920	1977	MA005
					Sim. Sea Water	BWOL	3.077	1.251	1.25	1.36	---	>67.7	133920	1977	MA005
						BWOL	3.073	1.253	1.25	1.36	---	>68.5	133920	1977	MA005

+ specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

* asterisk in specimen design column indicates that specimens are side-grooved

TABLE 6.17.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY Ti-6Al-4V ELI AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	RA	76.1	4.	3	76.8	0.7	3	---	---	---
Forging	ANNEALED	83.5	1.3	3	84.3	0.4	3	---	---	---

TABLE 6.17.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	FORGING	0.1	1-10				13.27	209.7	
RA	PLATE	-1	8			3.1			
		-1	10				23.32		
		-0.66	8			2.97	22.01		
		-0.66	10				23.96		
		-0.33	8			2.5	21.42		
		-0.33	10				20.27		
		0.	8			1.61	21.49		
		0.	10			1.71	18.61		
		0.1	10				11.54		
		0.55	8	0.01	0.2	5.22			

TABLE 6.17.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: S.S.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.1	1-10				16.66	372.39	

TABLE 6.17.1.2.3

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.	15				11.35		
		0.1	0.1					368.61	
		0.1	1					214.39	
		0.5	0.1				17.18		
		0.5	1				32.51		

TABLE 6.17.1.2.4

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: ALT JP4/$H_2$0 (D)**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*) ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	1					121.9	
		0.5	1				12.9		

TABLE 6.17.1.2.5

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Distilled Water**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.	15				5.45		
		0.1	1					140.93	
		0.5	1			0.25	12.97		

TABLE 6.17.1.2.6

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Dry Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.	15				4.47		
		0.1	1					130.8	
		0.5	0.1				11.6		
		0.5	1				11.87		
		0.8	1			1.08			

TABLE 6.17.1.2.7

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
ANNEALED	FORGING	0.1	1-10				12.21	249.29	
		0.1	5-20				8.34	158.75	
RA	PLATE	0.1	1-10				7.61	227.75	

TABLE 6.17.1.2.8

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.S.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA	PLATE	0.1	1-10				8.22		

TABLE 6.17.1.2.9

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: S.T.W.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	1					216.81	
		0.5	0.1				12.91		
		0.5	1			1.24	28.27		

TABLE 6.17.1.2.10

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-4V ELI AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: Water Sat JP4**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.	15				5.09		
		0.1	0.1					117.82	
		0.1	1					104.49	
		0.5	0.1				13.65		
		0.5	1				13.53		

TABLE 6.17.2.1

TITANIUM Ti-6Al-4V ELI K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)^2 (in.)	K_{Ic} (K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED	Forging	3.00	R.T.	L-T	117.0	3.996	2.001	CT	2.136	1.31	84.91	83.5	1.3	1976	NC001
		3.00			117.0	3.996	2.005	CT	2.143	1.26	83.21			1976	NC001
		3.00			117.0	4.000	2.005	CT	2.130	1.24	82.42			1976	NC001
ANNEALED	Forging	3.00	R.T.	T-L	117.0	3.997	2.023	CT	2.157	1.31	84.71	84.3	0.4	1976	NC001
		3.00			117.0	3.995	2.020	CT	2.146	1.28	83.89			1976	NC001
		3.00			117.0	3.991	2.005	CT	2.126	1.29	84.23			1976	NC001
RECRYSTALLIZE ANNEAL	Plate	3.00	R.T.	L-T	119.0	4.000	2.000	CT	2.072	0.94	73.32	76.1	4.0	1976	NC001
		3.00			119.0	4.000	2.000	CT	2.088	1.14	80.66			1976	NC001
		3.00			119.0	4.000	1.999	CT	2.117	0.97	74.26			1976	NC001
RECRYSTALLIZE ANNEAL	Plate	3.00	R.T.	T-L	122.0	4.000	2.000	CT	2.059	0.97	76.19	76.8	0.7	1976	NC001
		3.00			122.0	4.000	2.000	CT	2.102	0.98	76.61			1976	NC001
		3.00			122.0	4.000	2.000	CT	2.034	1.01	77.61			1976	NC001

TABLE 6.17.2.2

TI-6AL-4V (ELI) K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} ($K_{si}\sqrt{in.}$)	K_{app} MEAN	K_{app} STAN DEV	K_C ($K_{si}\sqrt{in.}$)	K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
ANNEALED	Sheet	0.03	R.T.	L-T	136.0	2.000	0.025	0.490	0.780	---	104.00	94.77*	---	---	127.27*	---	---	1964	60578
		0.03			136.0	2.000	0.025	0.480	0.800	---	104.00	93.65*			129.62*			1964	60578
		0.03			136.0	2.000	0.025	0.470	0.750	---	107.00	95.20*			127.37*			1964	60578
		0.03			136.0	2.000	0.025	0.480	0.750	---	104.00	93.65*			123.79*			1964	60578
		0.03			136.0	2.000	0.025	0.480	0.700	---	105.00	94.55*			119.24*			1964	60578
ANNEALED	Sheet	0.03	R.T.	L-T	136.0	4.000	0.025	1.270	1.600	---	71.80	108.22	107.2	3.0	126.55*	---	---	1964	60578
		0.03			136.0	4.000	0.025	1.280	1.700	---	68.50	103.76			126.31*			1964	60578
		0.03			136.0	4.000	0.025	1.260	1.650	---	70.60	105.88			127.29*			1964	60578
		0.03			136.0	4.030	0.025	1.270	1.530	---	73.60	110.82			125.44*			1964	60578
		0.03			136.0	4.040	0.025	1.270	1.650	---	74.90	112.74*			134.72*			1964	60578
ANNEALED	Sheet	0.03	R.T.	L-T	136.0	17.990	0.024	5.480	7.350	---	44.10	137.33	136.5	10.5	167.42	161.6	6.5	1964	60578
		0.03			136.0	17.980	0.025	5.490	7.610	---	42.10	131.26			164.08			1964	60578
		0.03			136.0	17.980	0.025	5.490	6.190	---	49.50	154.33			166.70			1964	60578
		0.03			136.0	18.000	0.025	5.500	6.980	---	41.60	129.83			152.10			1964	60578
		0.03			136.0	18.000	0.025	5.490	7.350	---	41.60	129.68			157.91			1964	60578

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

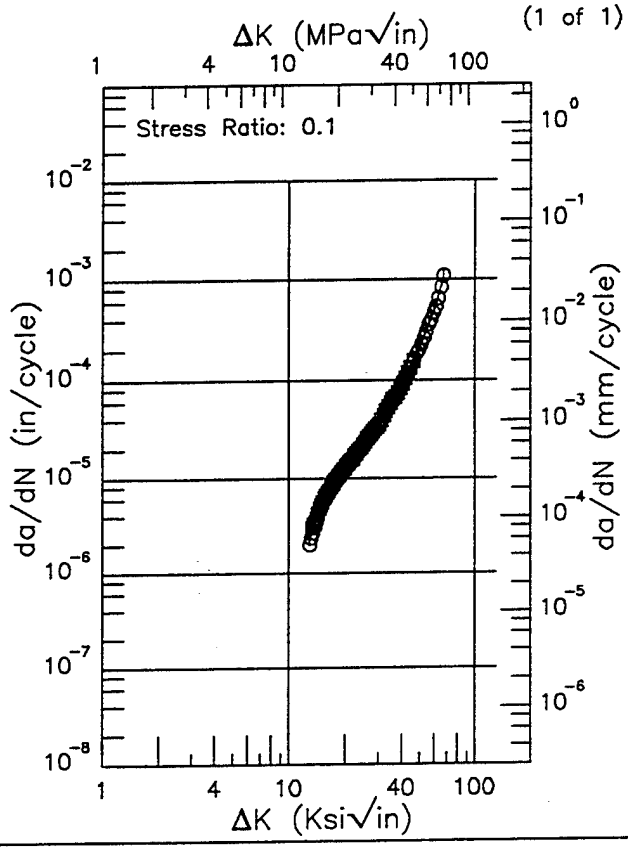
R

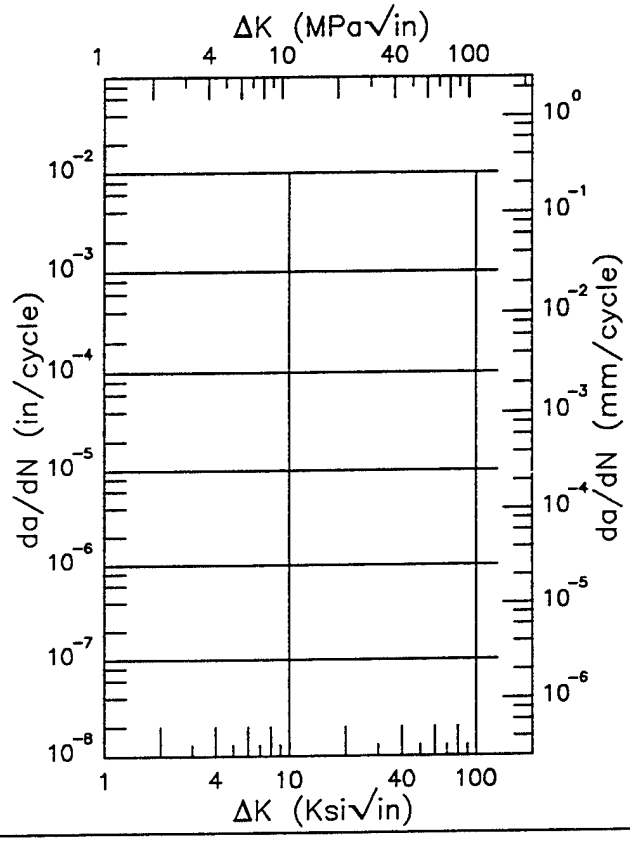
Ti–6Al–4V ELI

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: L–T
Frequency: 1 – 10 Hz
Environment: LAB AIR; RT

Yield Strength: 116.8 ksi
Ult. Strength: 126.7 ksi
Specimen Thk: 0.991 – 1.014 in.
Specimen Width: 7.4 in.
Ref: NC002

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.87 (min)	2.29
13.	2.44
16.	6.73
20.	13.3
25.	22.2
30.	35.9
35.	58.1
40.	91.3
50.	210.
60.	487.
67.30 (max)	1039.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
5.04	0. .5 .8 1.25 2.

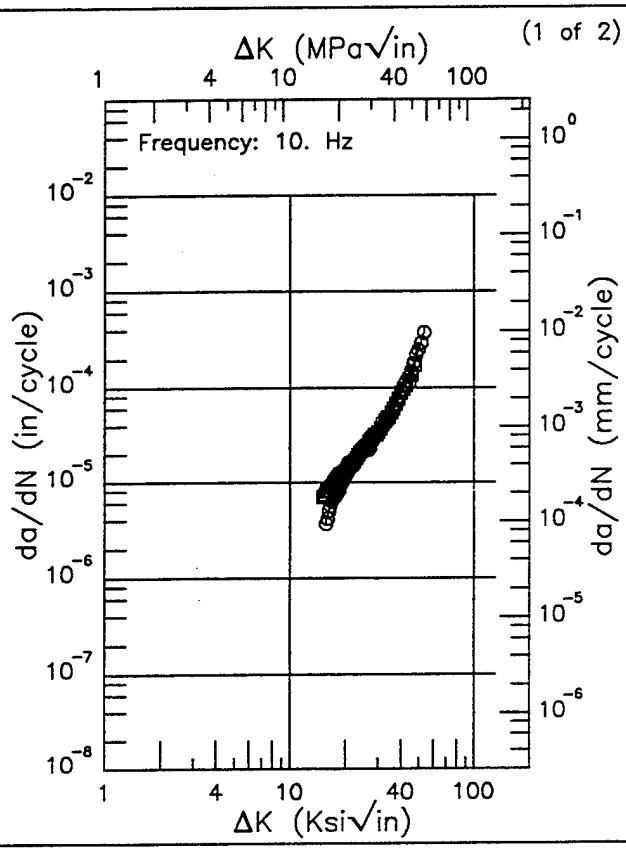
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

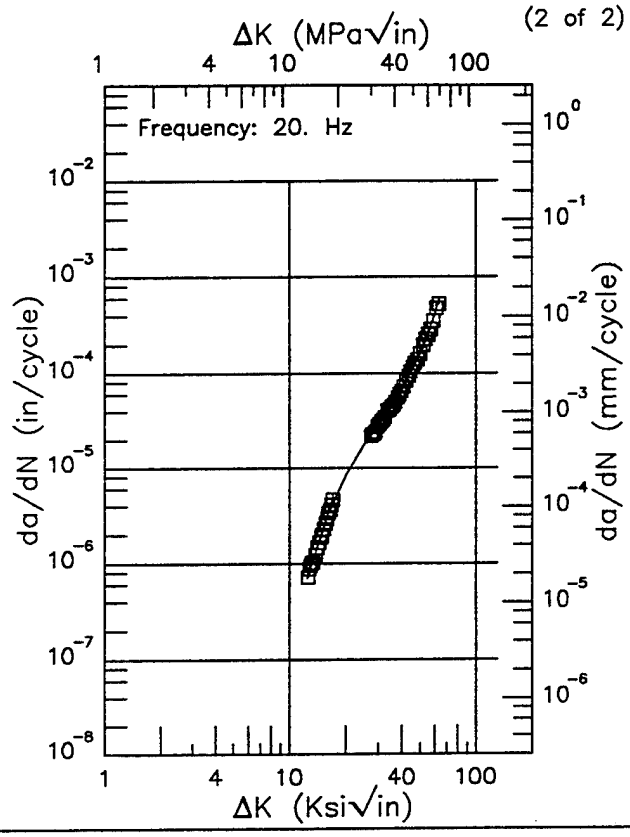
Figure 6.17.3.1.1

Ti–6Al–4V ELI F

Condition/Ht: ANNEALED
Form: 3 in. Forging
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Environment: LAB AIR; RT

Yield Strength: 116.9 ksi
Ult. Strength: 127 ksi
Specimen Thk: 0.999 – 1.002 in.
Specimen Width: 7.4 in.
Ref: NC002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.12 (min)	5.71
16.	6.57
20.	12.2
25.	22.1
30.	33.4
35.	51.4
40.	85.8
50.	249.
53.22 (max)	377.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.55 (min)	0.700
13.	0.903
16.	3.15
20.	8.34
25.	17.3
30.	28.7
35.	44.3
40.	67.1
50.	159.
60.	408.
63.28 (max)	567.

RMS % Error	Life Prediction Ratio Summary
12.15	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
4.28	0. .5 .8 1.25 2.

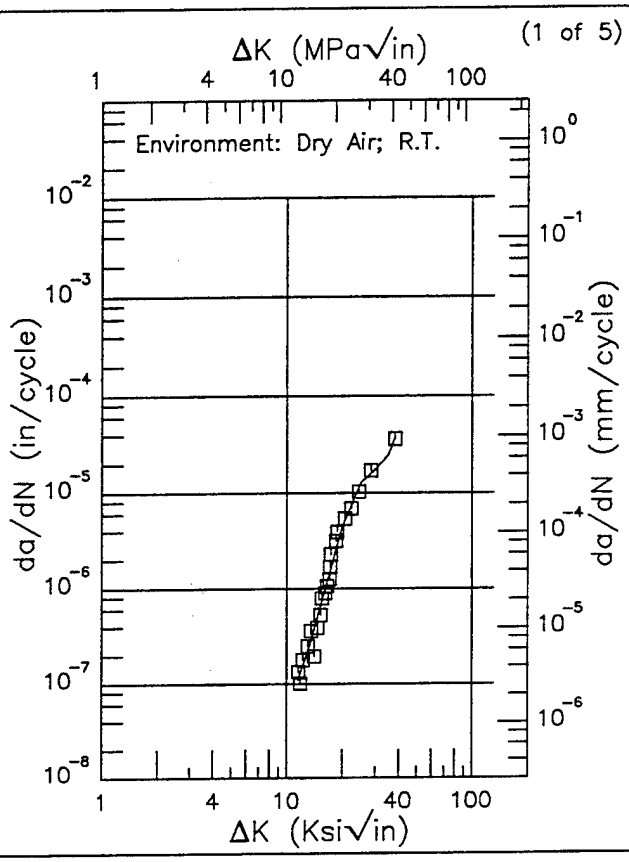
Figure 6.17.3.1.2

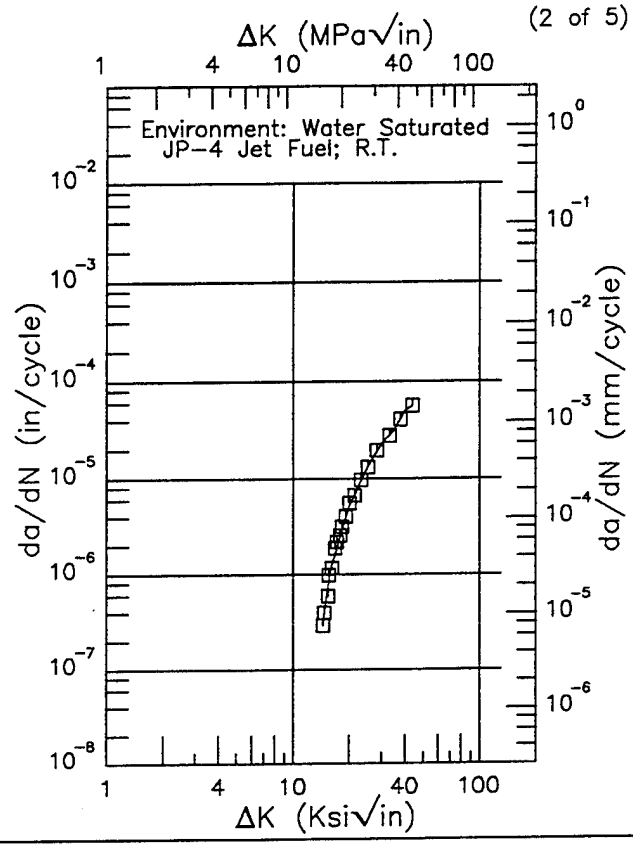
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.
Frequency: 15 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.53 (min)	0.110
13.	0.217
16.	0.934
20.	4.47
25.	12.8
30.	17.6
35.	24.9
37.95 (max)	36.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.45 (min)	0.315
16.	1.12
20.	5.09
25.	12.8
30.	22.9
35.	32.4
40.	50.1
43.49 (max)	56.2

RMS % Error	Life Prediction Ratio Summary
21.95	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
12.01	0. .5 .8 1.25 2.

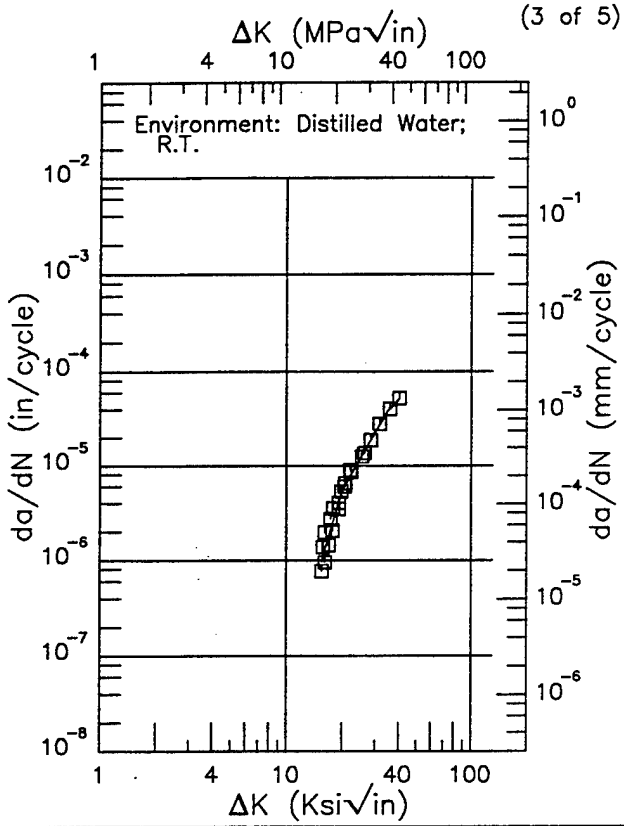
Figure 6.17.3.1.3

Ti–6Al–4V ELI E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.
Frequency: 15 Hz

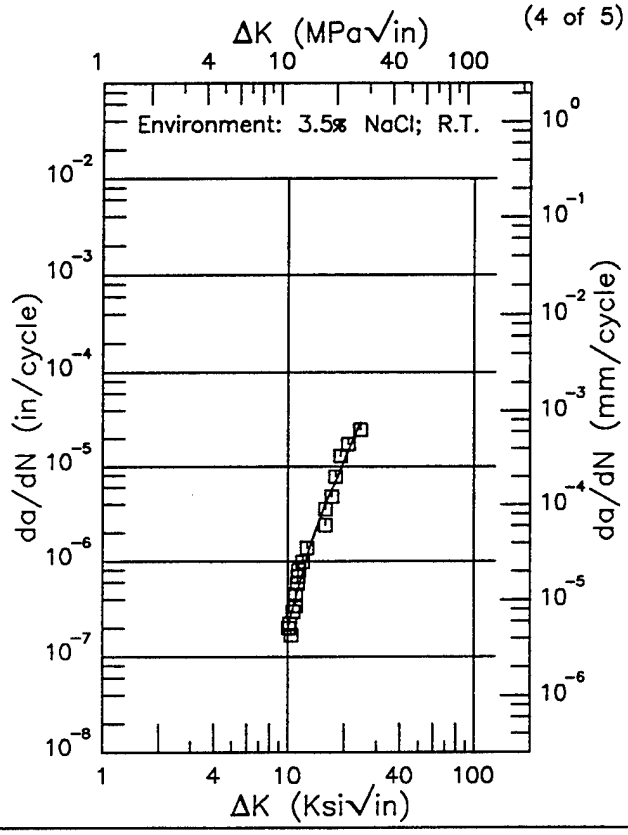
Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

(3 of 5)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.47 (min)	0.959
16.	1.24
20.	5.45
25.	12.2
30.	23.0
35.	38.5
40.	51.4
40.10 (max)	51.9

(4 of 5)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.07 (min)	0.227
13.	1.34
16.	4.02
20.	11.3
24.47 (max)	29.9

RMS % Error	Life Prediction Ratio Summary
20.50	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
26.12	0. .5 .8 1.25 2.

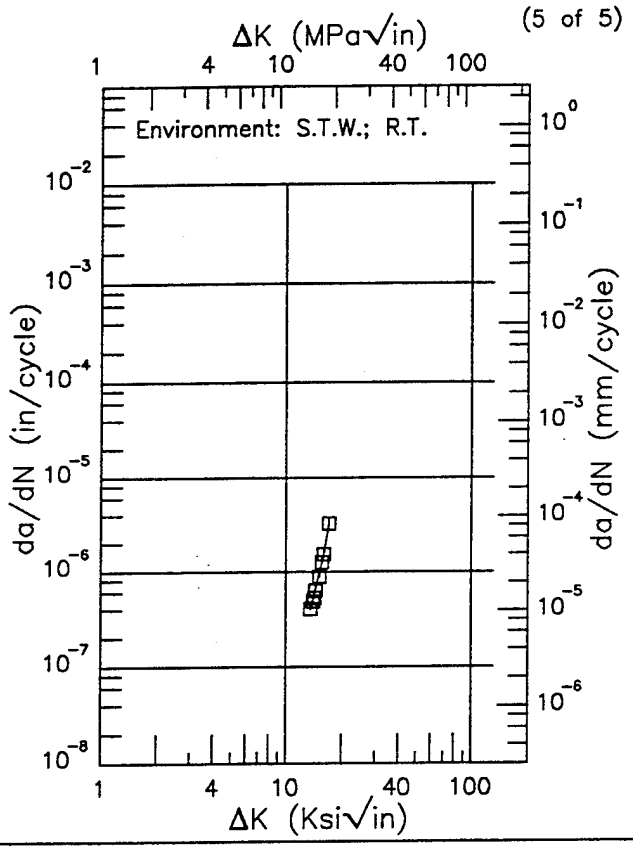
Figure 6.17.3.1.3 (Continued)

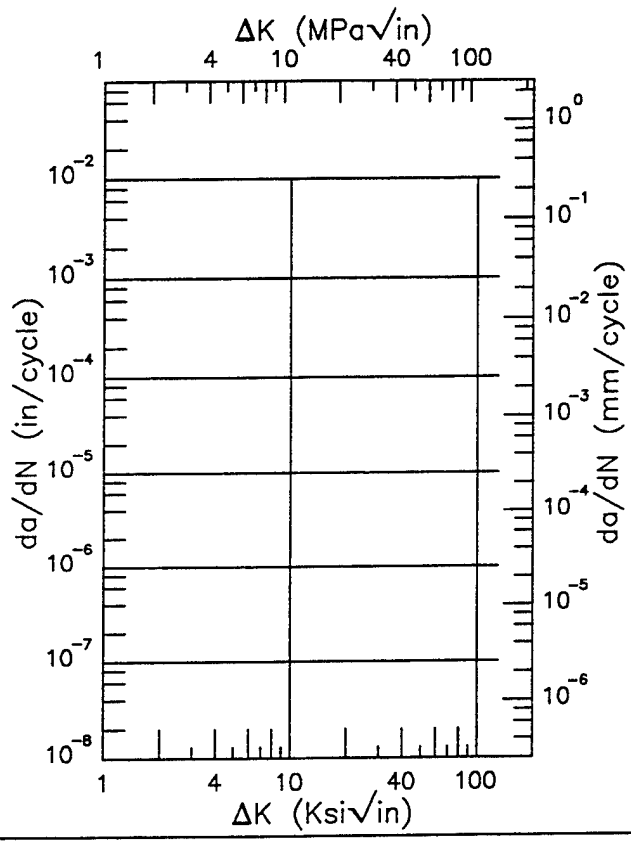
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.
Frequency: 15 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.53 (min)	0.399
16.	1.54
16.98 (max)	3.23

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
4.83	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

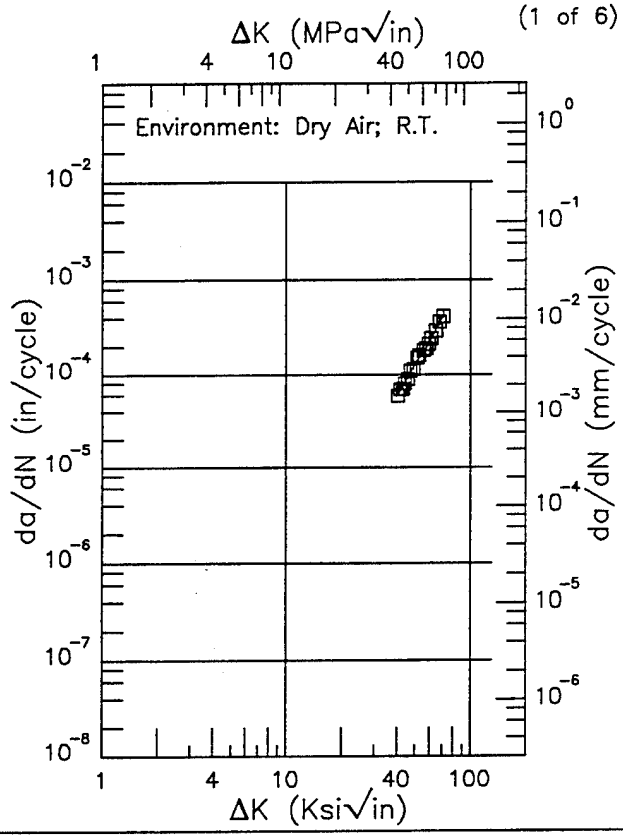
Figure 6.17.3.1.3 (Concluded)

Ti–6Al–4V ELI E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 1 Hz

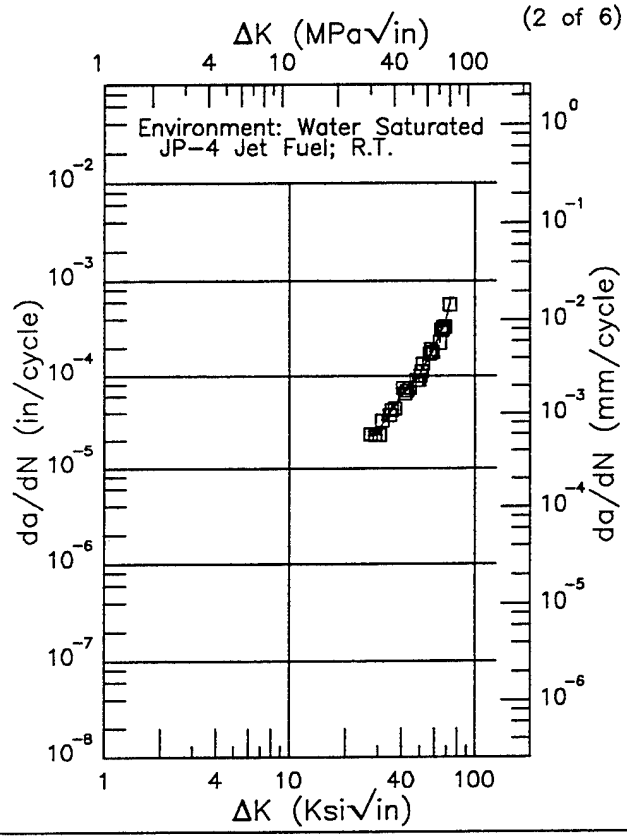
Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

(1 of 6)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
40.32 (min)	61.2
50.	131.
60.	221.
70.	407.
71.02 (max)	414.

(2 of 6)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.33 (min)	22.4
30.	25.1
35.	40.1
40.	60.8
50.	104.
60.	203.
70.	399.
72.48 (max)	571.

RMS % Error	Life Prediction Ratio Summary
3.90	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
8.12	0. .5 .8 1.25 2.

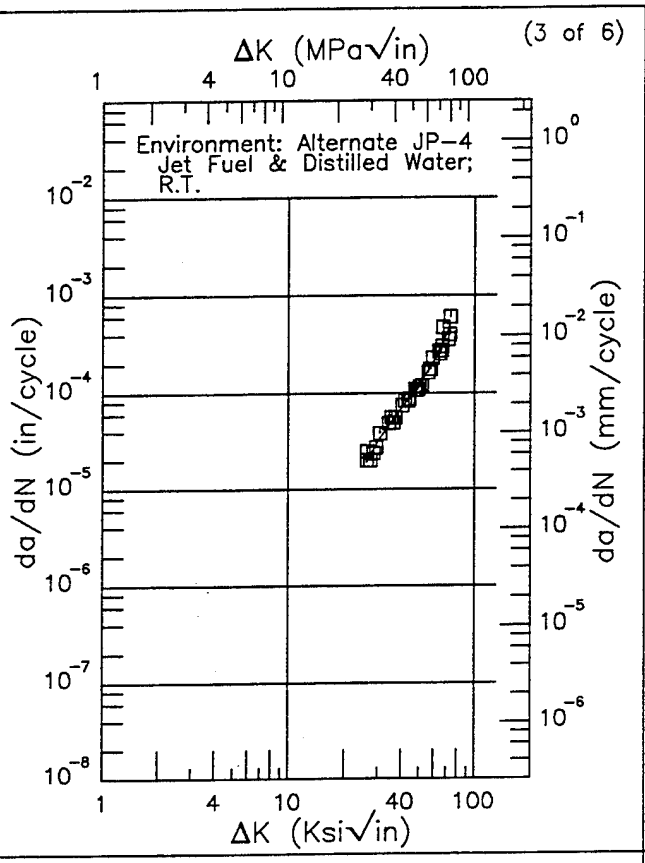
Figure 6.17.3.1.4

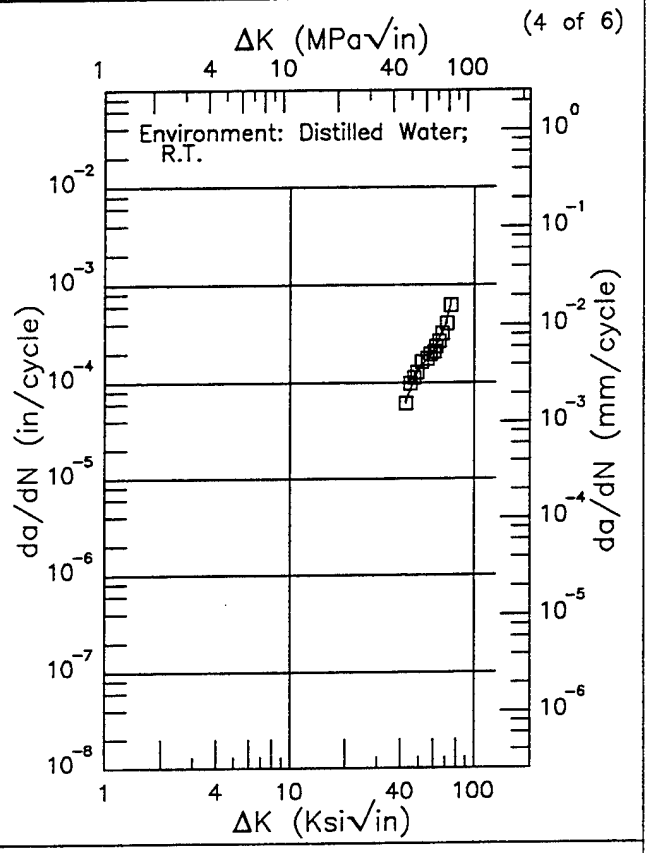
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.24 (min)	19.2
30.	31.1
35.	48.9
40.	69.0
50.	122.
60.	212.
70.	388.
73.62 (max)	489.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
42.57 (min)	63.1
50.	141.
60.	210.
70.	383.
74.51 (max)	607.

RMS % Error	Life Prediction Ratio Summary
12.68	0. .5 .8 1.25 2.

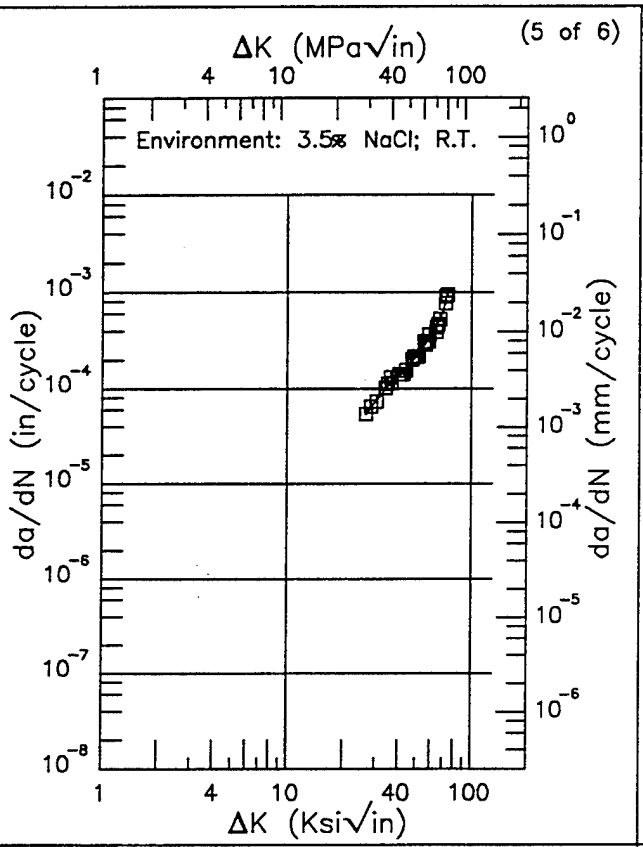
RMS % Error	Life Prediction Ratio Summary
6.05	0. .5 .8 1.25 2.

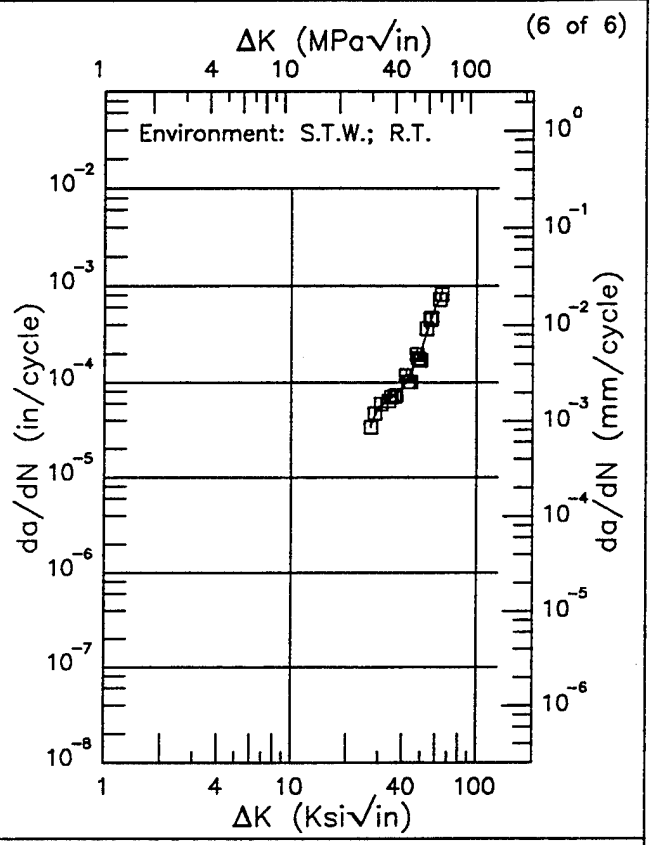
Figure 6.17.3.1.4 (Continued)

Ti–6Al–4V ELI E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.53 (min)	53.1
30.	73.9
35.	107.
40.	138.
50.	214.
60.	365.
70.	628.
73.43 (max)	1018.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
27.01 (min)	35.5
30.	55.2
35.	69.5
40.	87.7
50.	217.
60.	620.
64.60 (max)	754.

RMS % Error	Life Prediction Ratio Summary
6.28	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
10.25	0. .5 .8 1.25 2.

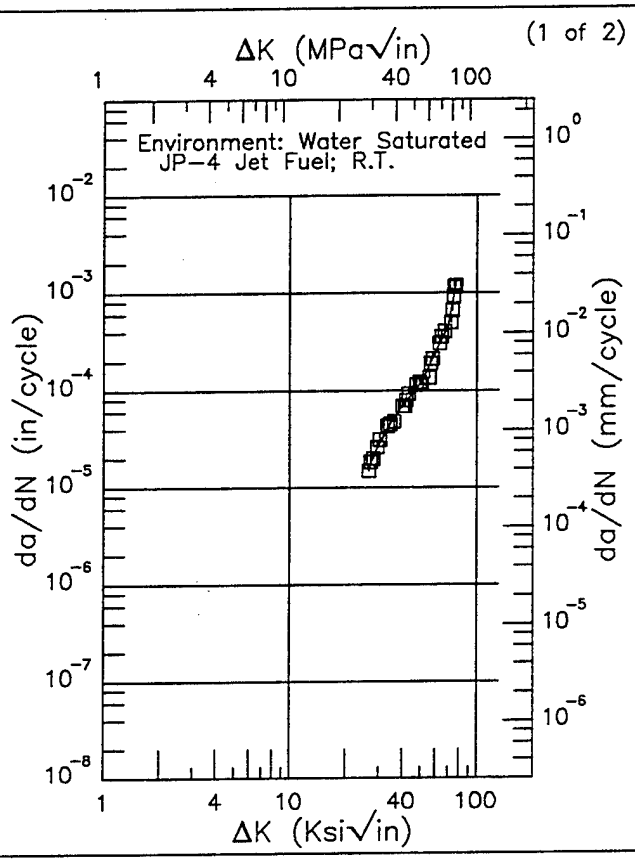
Figure 6.17.3.1.4 (Concluded)

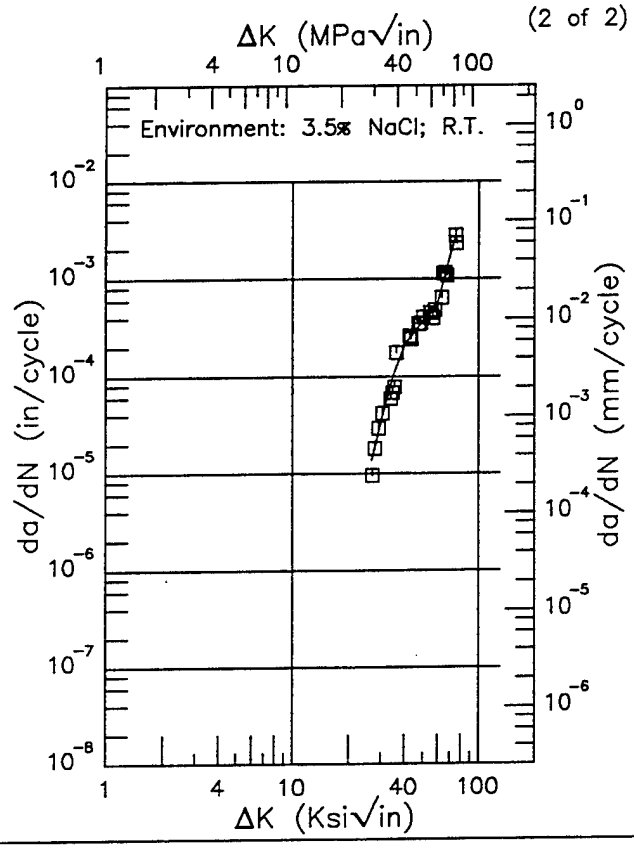
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.1
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.50 (min)	15.9
30.	27.4
35.	48.2
40.	69.5
50.	118.
60.	244.
70.	459.
76.78 (max)	1199.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
26.86 (min)	13.8
30.	33.9
35.	103.
40.	209.
50.	369.
60.	551.
70.	1627.
75.41 (max)	2758.

RMS % Error	Life Prediction Ratio Summary
9.50	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
17.62	0. .5 .8 1.25 2.

Figure 6.17.3.1.5

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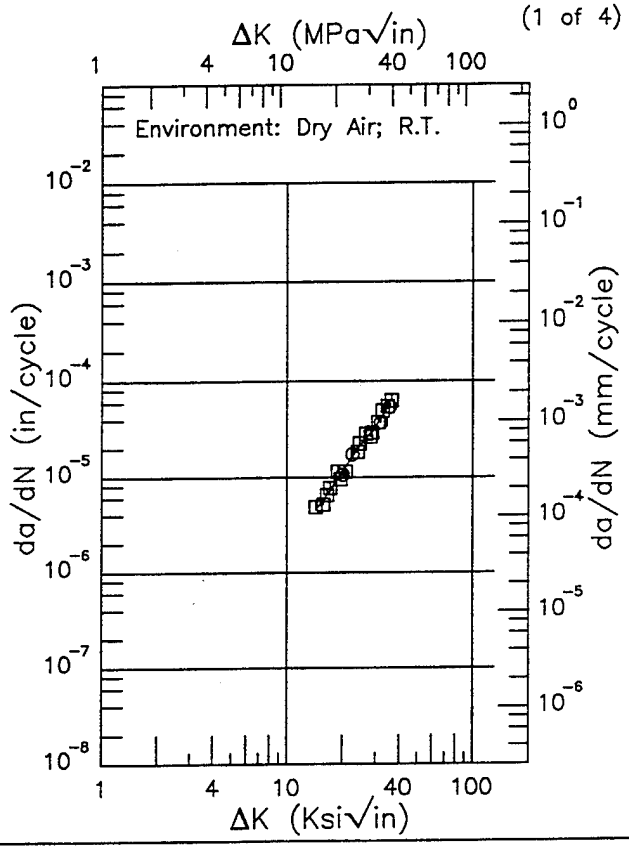
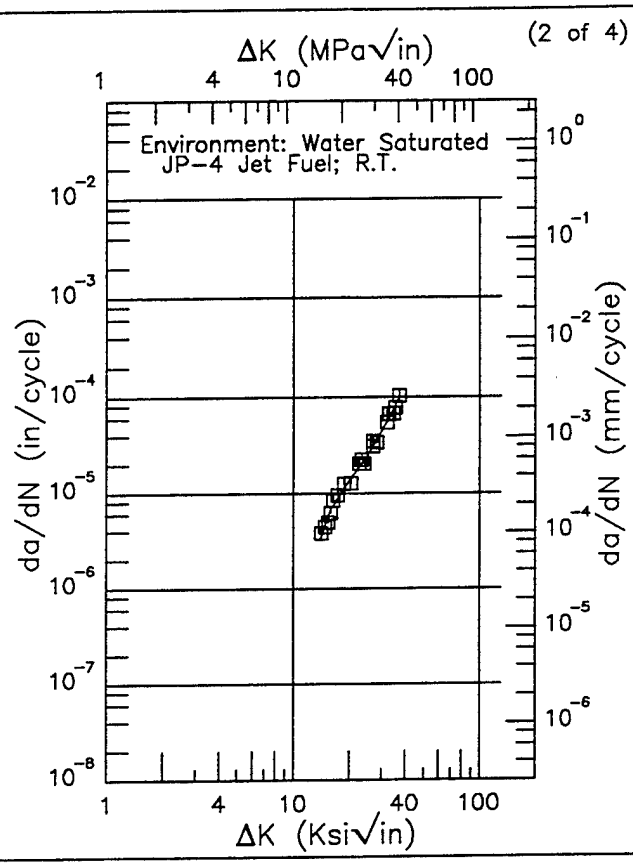
Ti-6Al-4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T-L
Stress Ratio: 0.5
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.31 (min)	4.58
16.	5.96
20.	11.6
25.	22.4
30.	33.4
35.	55.8
36.37 (max)	57.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.08 (min)	3.34
16.	6.89
20.	13.7
25.	24.5
30.	44.6
35.	76.9
37.10 (max)	101.

RMS % Error	Life Prediction Ratio Summary
8.04	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
8.44	0. .5 .8 1.25 2.

Figure 6.17.3.1.6

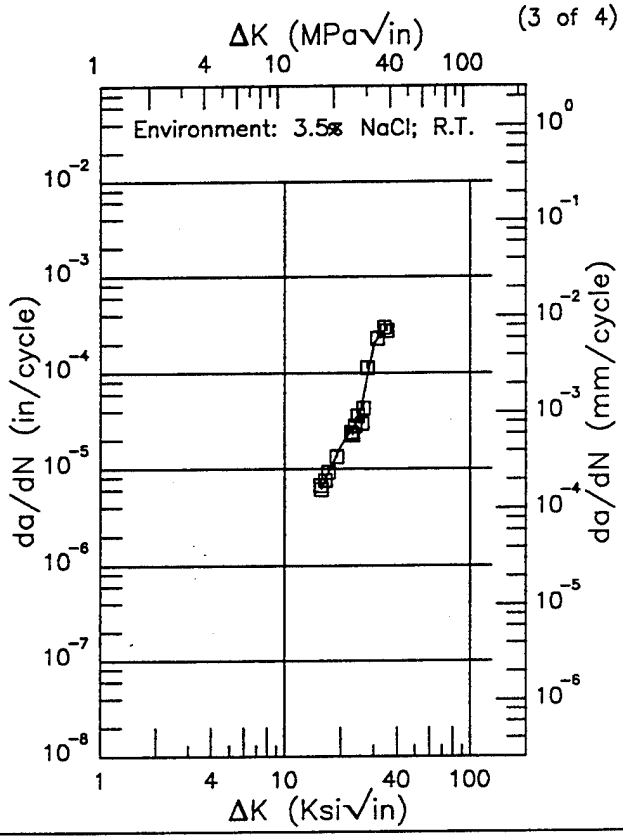
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 0.1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

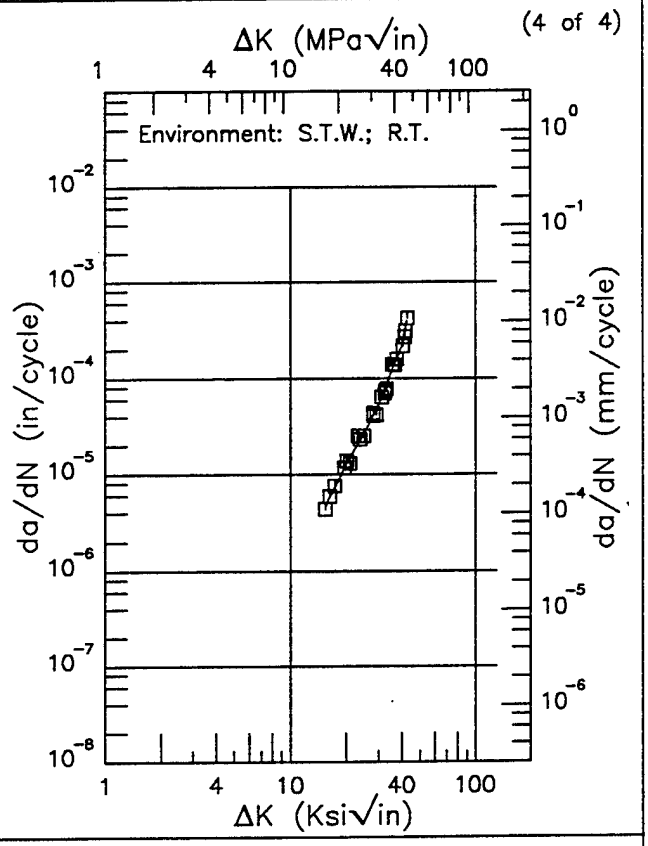
(3 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.54 (min)	6.43
16.	6.87
20.	17.2
25.	34.1
30.	203.
35.	294.
35.28 (max)	305.

RMS % Error	Life Prediction Ratio Summary
15.51	0. .5 .8 1.25 2.

(4 of 4)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.38 (min)	4.60
16.	5.38
20.	12.9
25.	26.5
30.	53.2
35.	116.
40.	217.
42.70 (max)	395.

RMS % Error	Life Prediction Ratio Summary
7.85	0. .5 .8 1.25 2.

Figure 6.17.3.1.6 (Concluded)

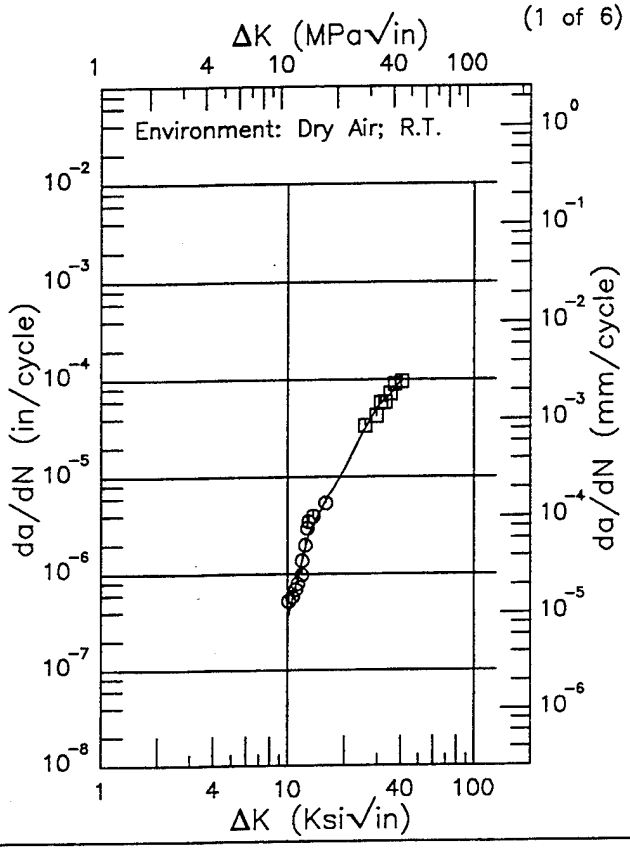
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140

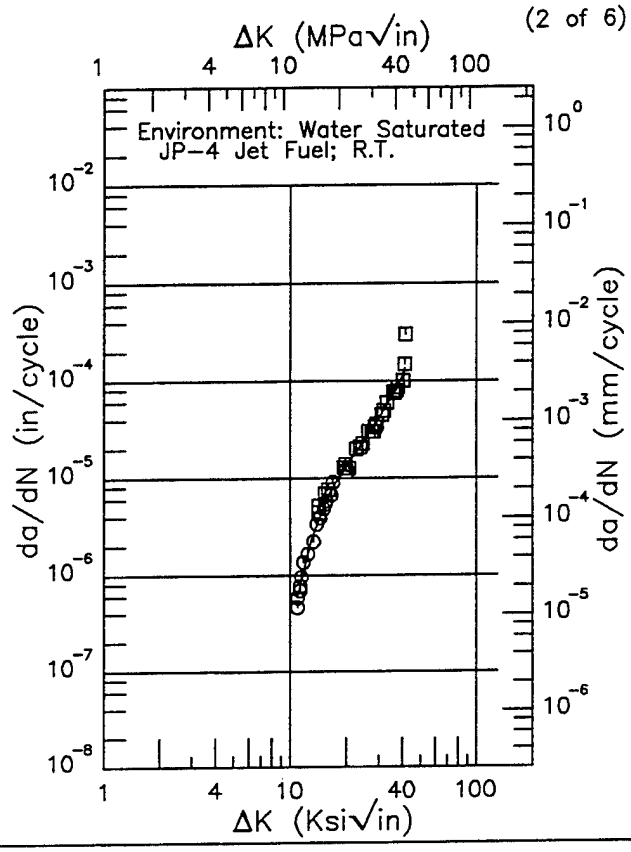
(1 of 6)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.10 (min)	0.370
13.	2.57
16.	5.94
20.	11.9
25.	28.3
30.	51.8
35.	68.9
40.	97.4
40.48 (max)	102.

RMS % Error	Life Prediction Ratio Summary
20.54	0. .5 .8 1.25 2.

(2 of 6)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.91 (min)	0.592
13.	2.27
16.	6.61
20.	13.5
25.	23.7
30.	41.8
35.	67.4
40.	113.
41.26 (max)	136.

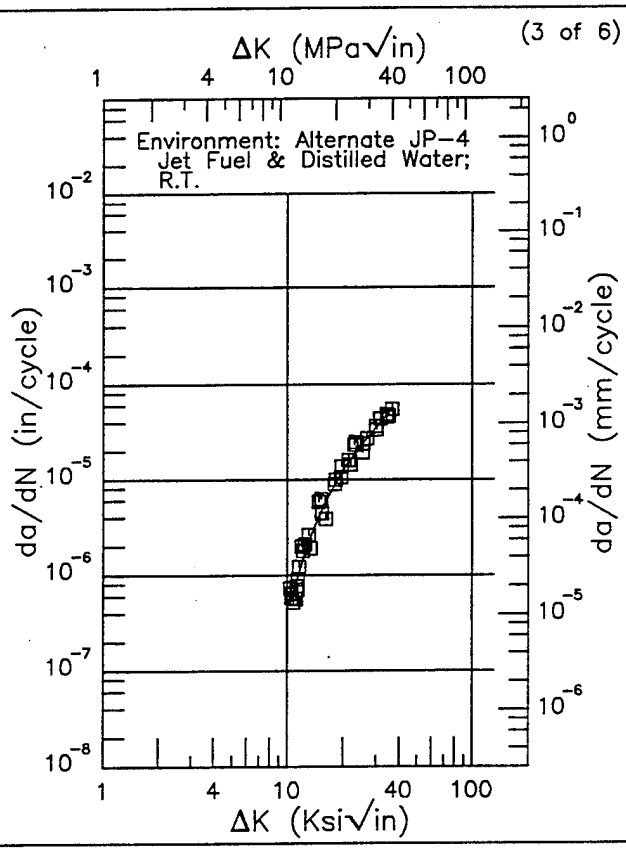
RMS % Error	Life Prediction Ratio Summary
22.56	0. .5 .8 1.25 2.

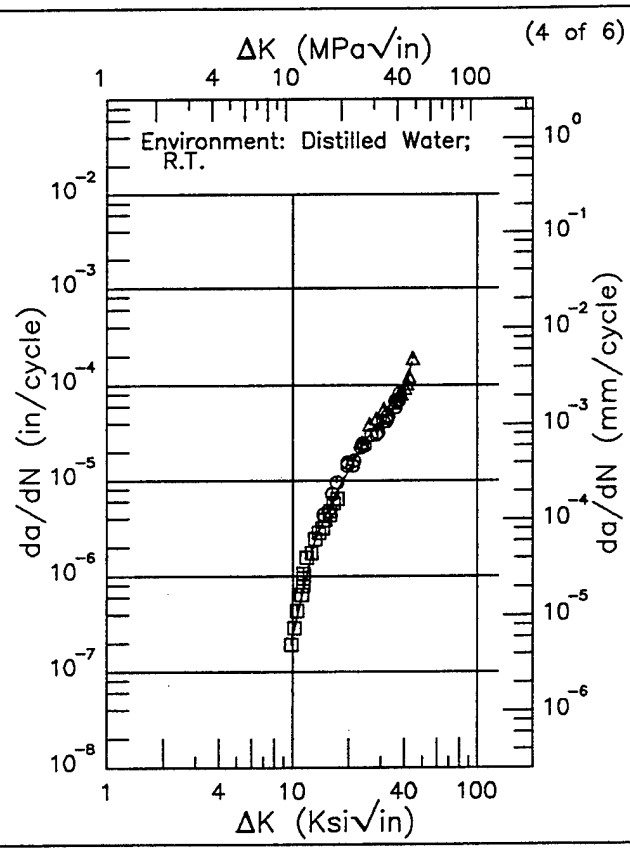
Figure 6.17.3.1.7

Ti–6Al–4V ELI E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.34 (min)	0.502
13.	2.19
16.	5.87
20.	12.9
25.	23.5
30.	35.5
35.	50.1
36.59 (max)	55.4

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.85 (min)	0.208
10.	0.247
13.	2.16
16.	5.72
20.	13.0
25.	27.7
30.	42.1
35.	58.5
40.	95.3
44.21 (max)	173.

RMS % Error	Life Prediction Ratio Summary
22.73	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
16.37	0. .5 .8 1.25 2.

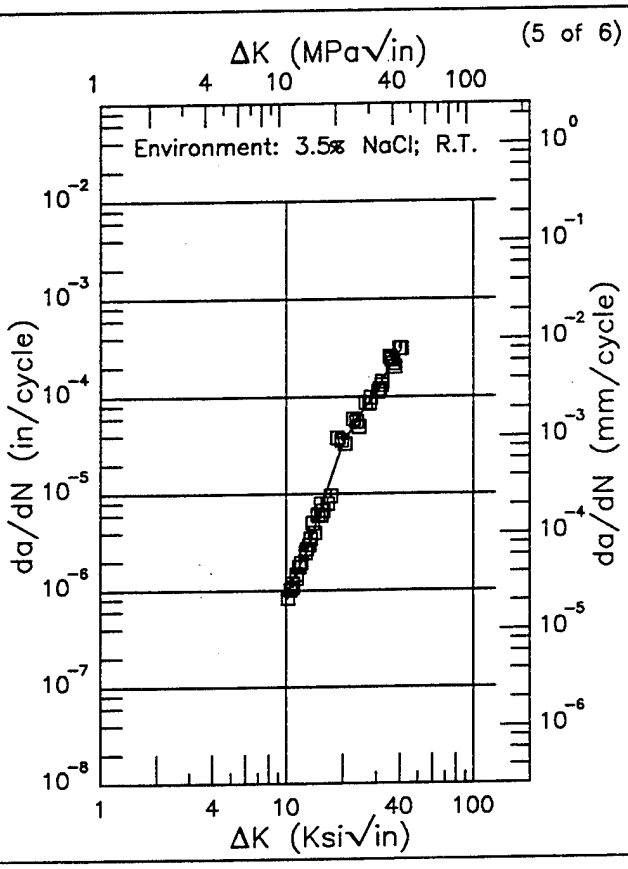
Figure 6.17.3.1.7 (Continued)

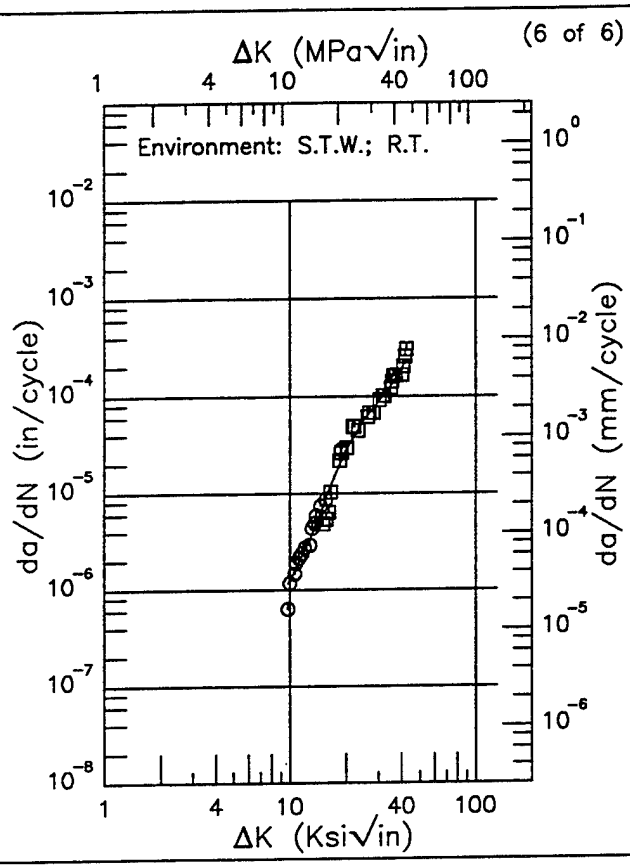
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.16 (min)	0.986
13.	2.59
16.	9.25
20.	32.5
25.	67.8
30.	111.
35.	194.
40.	290.
40.69 (max)	300.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.76 (min)	1.16
10.	1.24
13.	3.56
16.	10.1
20.	28.3
25.	57.8
30.	88.7
35.	128.
40.	190.
42.18 (max)	232.

RMS % Error	Life Prediction Ratio Summary
18.26	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
18.87	0. .5 .8 1.25 2.

Figure 6.17.3.1.7 (Concluded)

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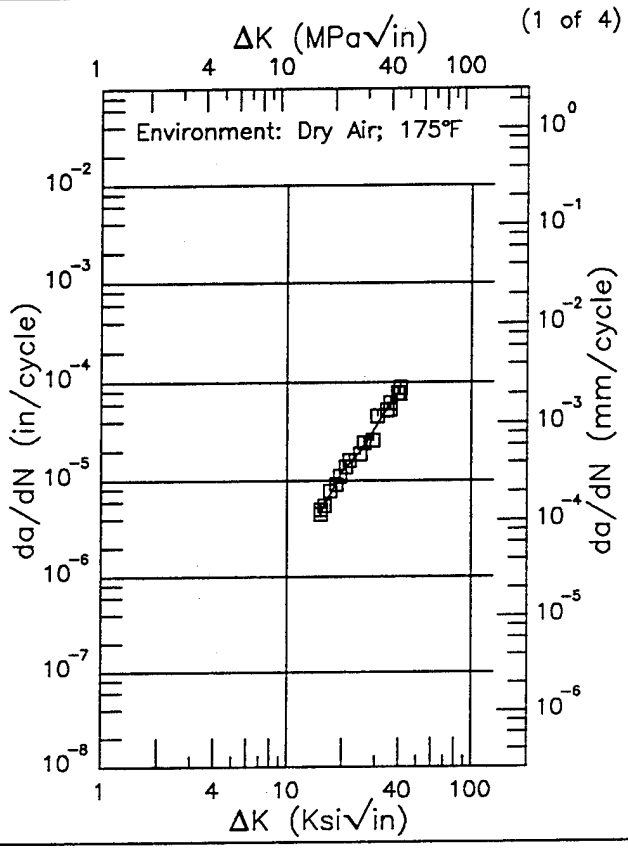
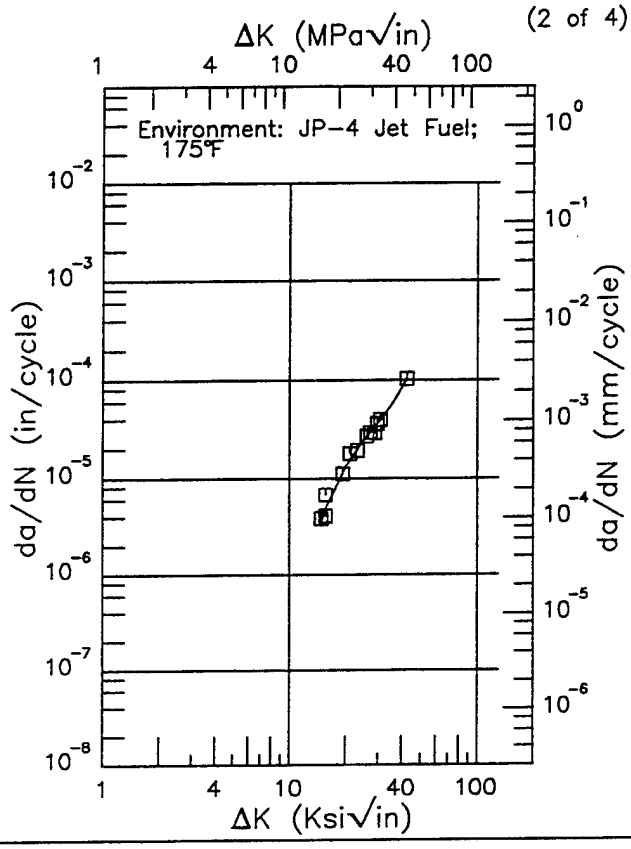
Ti–6Al–4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.15 (min)	4.53
16.	5.63
20.	12.4
25.	20.0
30.	34.6
35.	56.7
40.	78.4
40.96 (max)	92.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
14.71 (min)	3.40
16.	5.35
20.	13.1
25.	24.2
30.	37.0
35.	54.6
40.	82.7
42.28 (max)	101.

RMS % Error	Life Prediction Ratio Summary
9.01	0. .5 .8 1.25 2.

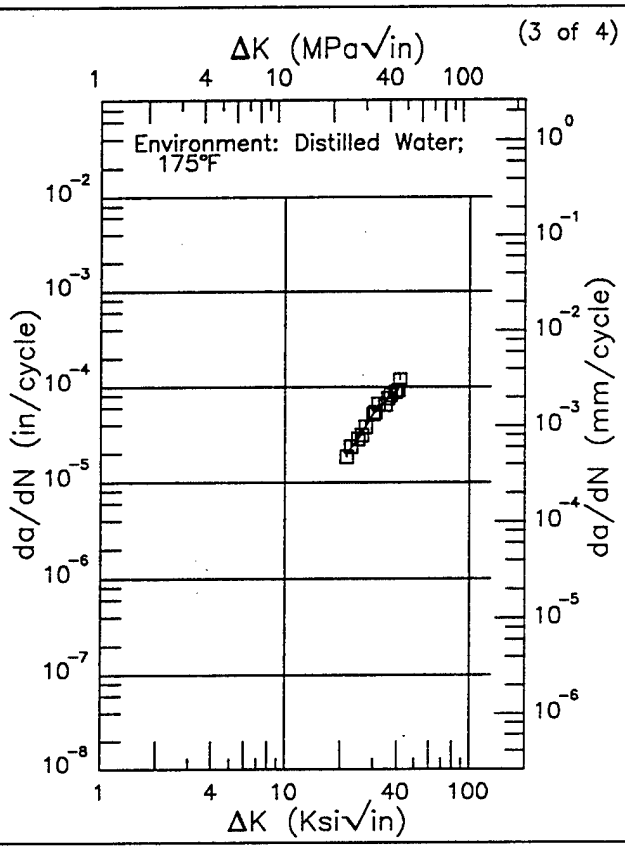
RMS % Error	Life Prediction Ratio Summary
15.33	0. .5 .8 1.25 2.

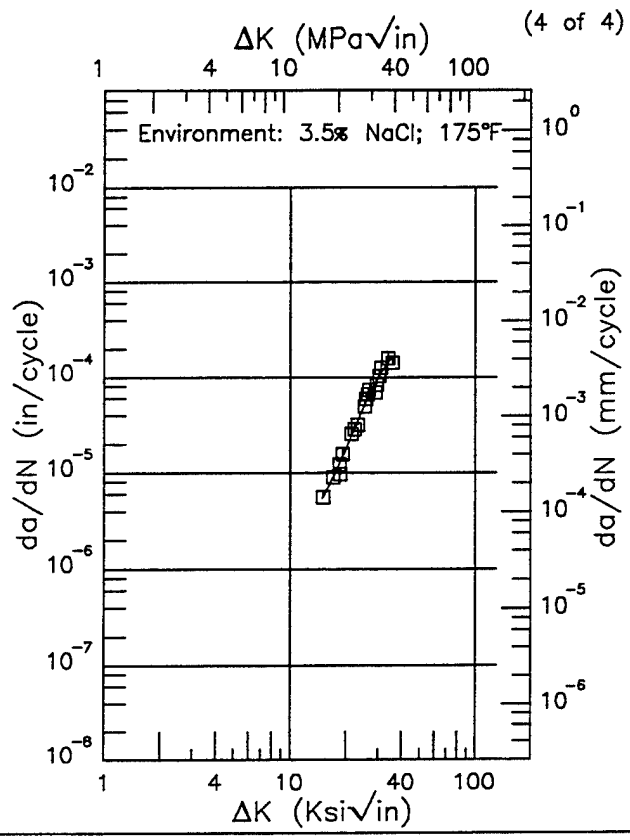
Figure 6.17.3.1.8

Ti–6Al–4V ELI E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T–L
Stress Ratio: 0.5
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.49 (min)	20.2
25.	28.9
30.	52.4
35.	71.2
40.	93.3
41.36 (max)	104.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
15.01 (min)	5.51
16.	6.93
20.	17.8
25.	48.6
30.	100.
35.	159.
35.56 (max)	165.

RMS % Error	Life Prediction Ratio Summary
5.93	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
11.42	0. .5 .8 1.25 2.

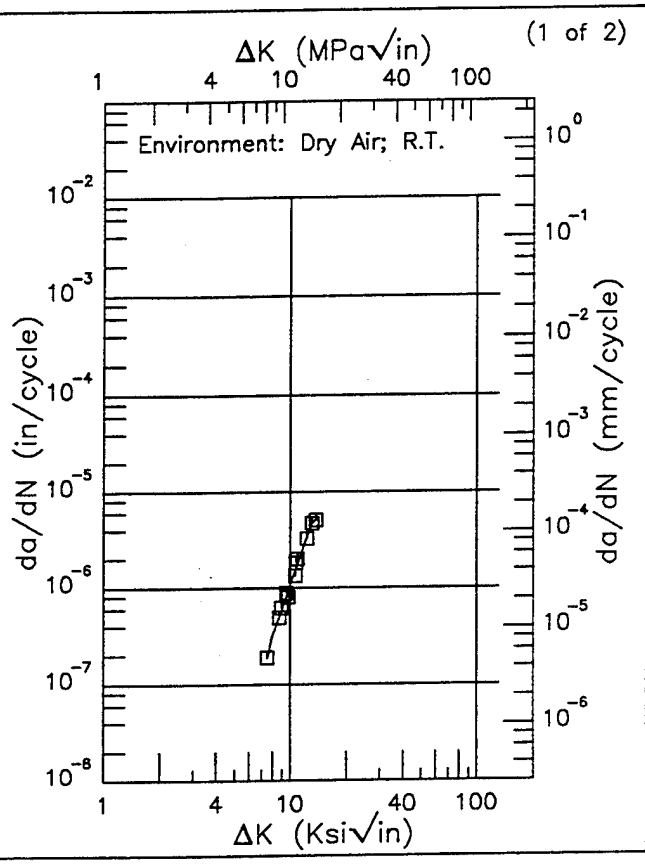
Figure 6.17.3.1.8 (Concluded)

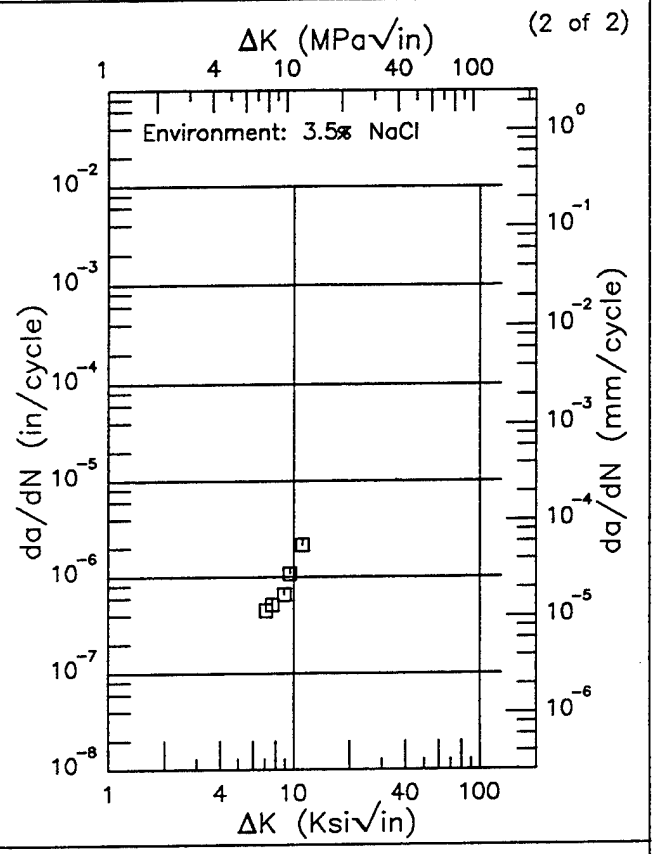
Ti-6Al-4V ELI

E

Condition/Ht: BA
Form: 1 in. Plate
Specimen Type: DCB
Orientation: T-L
Stress Ratio: 0.8
Frequency: 1 Hz

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 88140





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.50 (min)	0.187
8.	0.328
9.	0.594
10.	1.08
13.	4.63
13.61 (max)	5.09

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
9.34	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

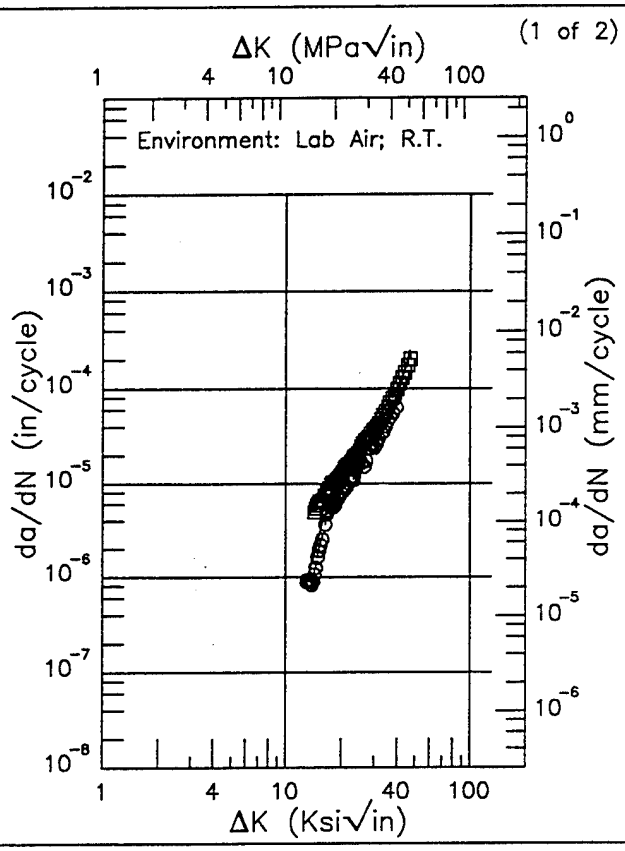
Figure 6.17.3.1.9

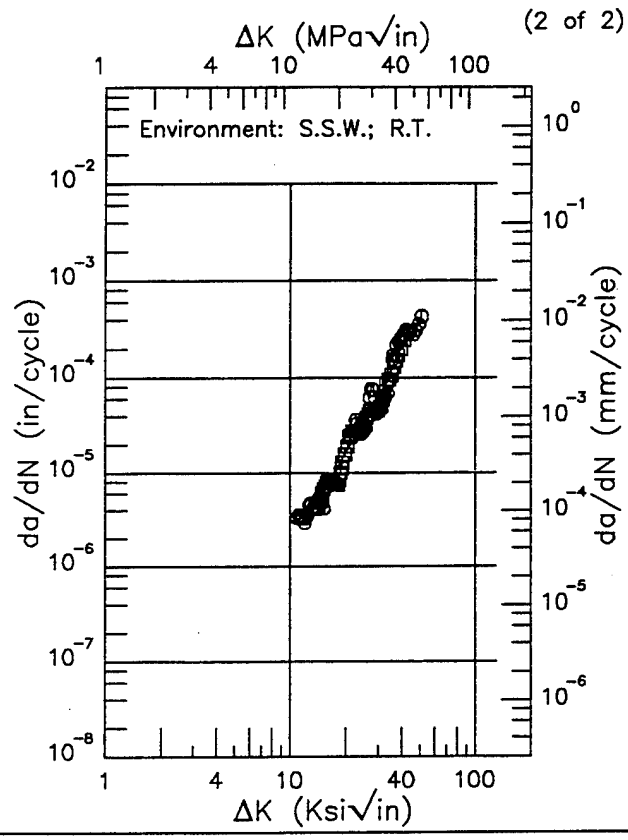
Ti–6Al–4V ELI

E

Condition/Ht: RA
Form: 3 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1
Frequency: 1 – 10 Hz

Yield Strength: 119.4 ksi
Ult. Strength: 127.8 ksi
Specimen Thk: 1.003 – 1.04 in.
Specimen Width: 7.4 in.
Ref: NC002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.94 (min)	0.809
13.	0.847
16.	4.28
20.	11.5
25.	20.4
30.	30.6
35.	48.2
40.	85.8
47.16 (max)	248.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.88 (min)	3.61
13.	3.78
16.	7.01
20.	16.7
25.	32.1
30.	57.4
35.	120.
40.	223.
50.	372.
50.76 (max)	385.

RMS % Error 45.17

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

RMS % Error 20.08

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

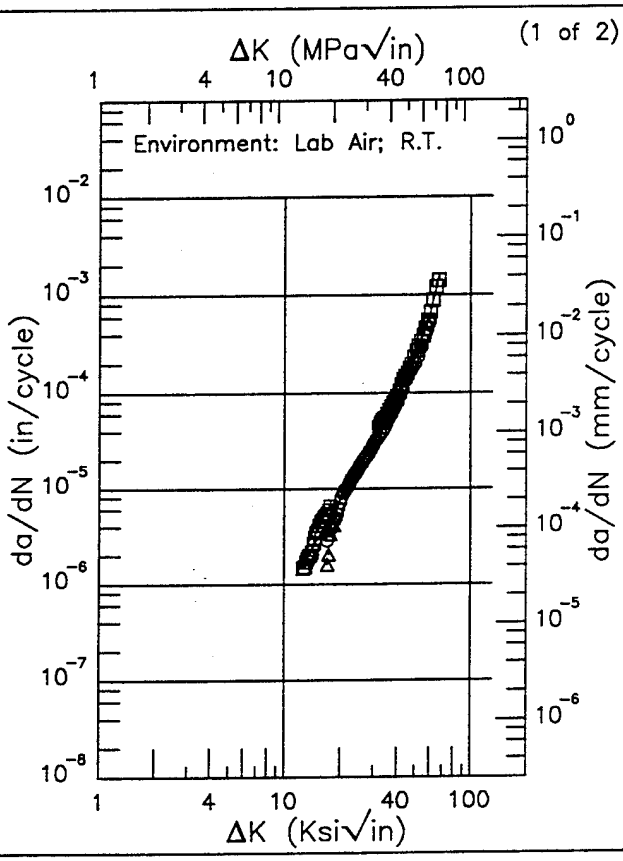
Figure 6.17.3.1.10

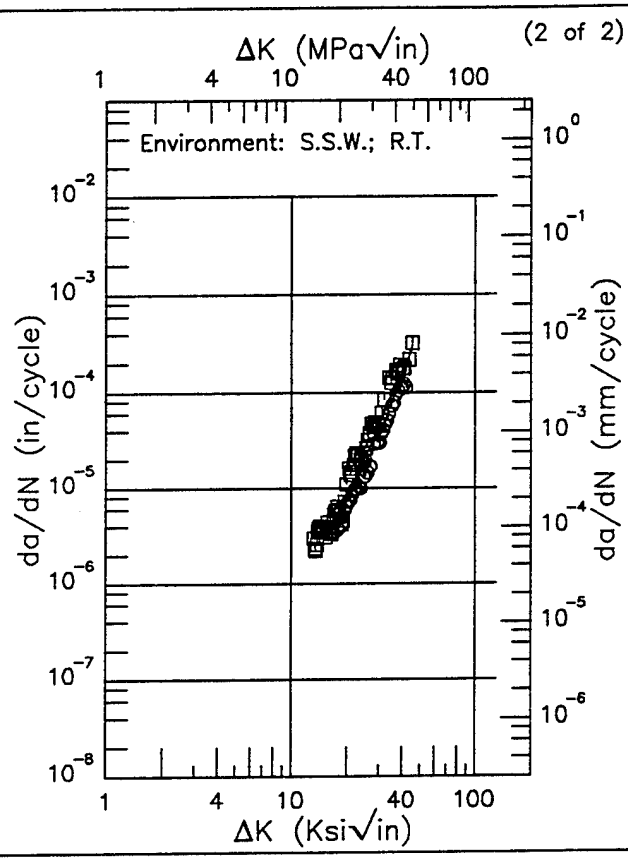
Ti–6Al–4V ELI

E

Condition/Ht: RA
Form: 3 in. Plate
Specimen Type: CT
Orientation: T–L
Stress Ratio: 0.1
Frequency: 1 – 10 Hz

Yield Strength: 122 ksi
Ult. Strength: 130.2 ksi
Specimen Thk: 0.923 – 1.01 in.
Specimen Width: 7.4 in.
Ref: NC002



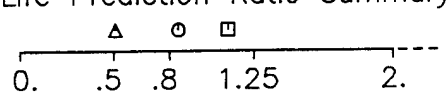


ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
12.57 (min)	1.53
13.	1.74
16.	3.67
20.	7.61
25.	15.8
30.	30.1
35.	53.6
40.	89.9
50.	228.
60.	618.
67.29 (max)	1541.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.17 (min)	3.07
16.	3.70
20.	8.22
25.	20.0
30.	44.4
35.	91.9
40.	134.
45.43 (max)	309.

RMS % Error 15.63

Life Prediction Ratio Summary



RMS % Error 31.46

Life Prediction Ratio Summary

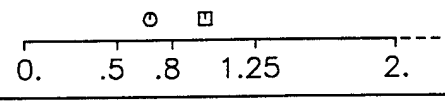
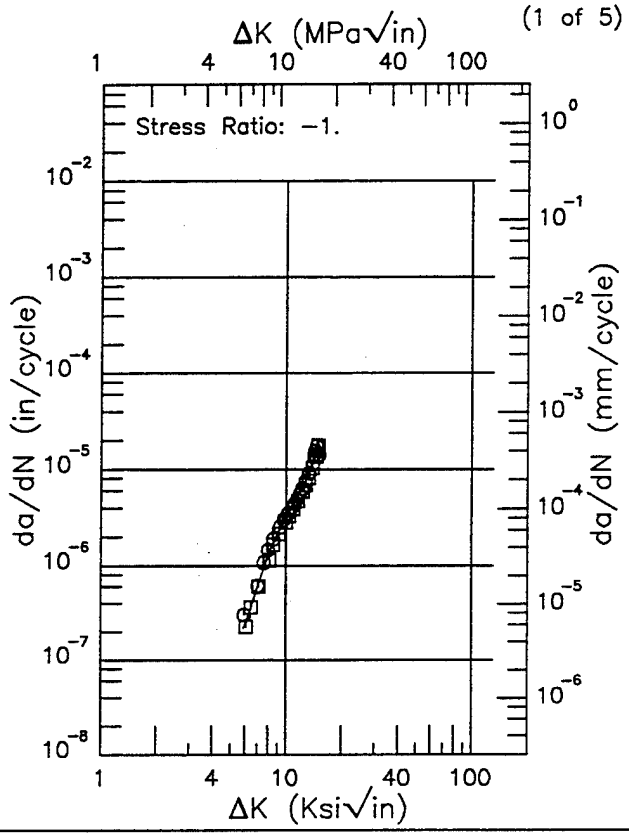


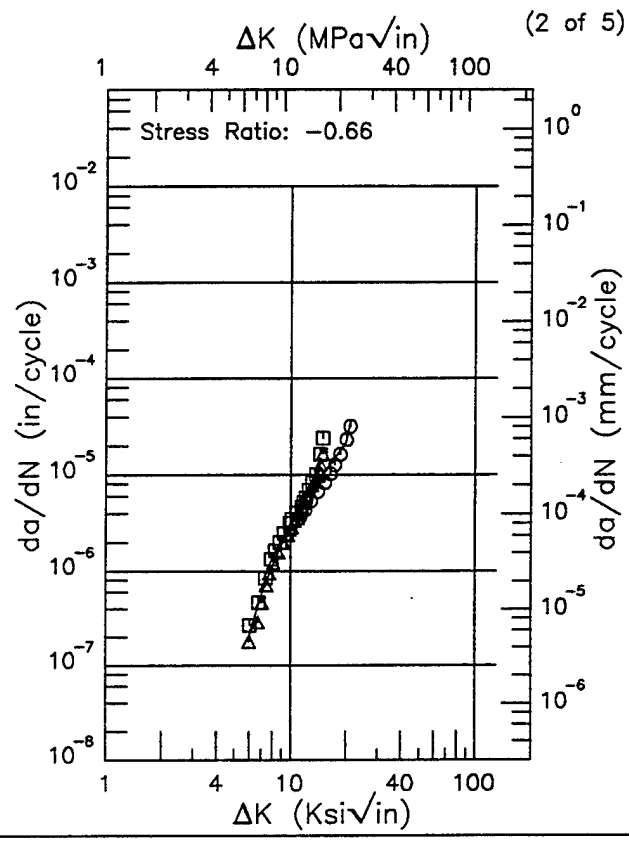
Figure 6.17.3.1.11

Ti–6Al–4V ELI R

Condition/Ht: RA
Form: 0.5 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 8 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.246 – 0.252 in.
Specimen Width: 3.995 – 4.005 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.92 (min)	0.219
6.	0.234
7.	0.591
8.	1.30
9.	2.19
10.	3.10
13.	8.07
14.97 (max)	18.3

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.97 (min)	0.201
6.	0.208
7.	0.547
8.	1.11
9.	1.92
10.	2.97
13.	7.40
16.	11.7
20.	22.0
21.02 (max)	33.5

RMS % Error	Life Prediction Ratio Summary
10.56	⊡ ⊙ 0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
27.47	△⊙ ⊡ 0. .5 .8 1.25 2.

Figure 6.17.3.1.12

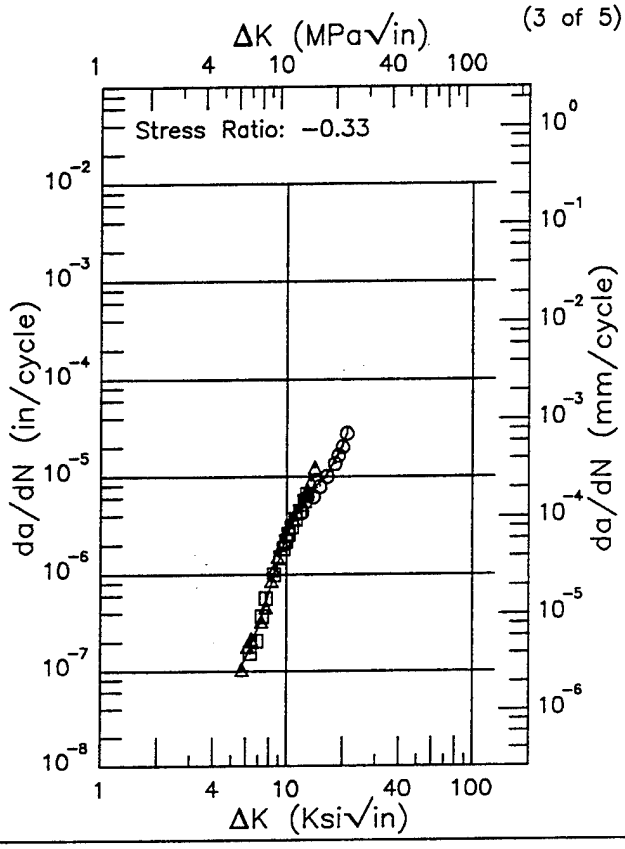
Ti-6Al-4V ELI

R

Condition/Ht: RA
Form: 0.5 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L-T
Frequency: 8 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.246 – 0.252 in.
Specimen Width: 3.995 – 4.005 in.
Ref: NC005

(3 of 5)



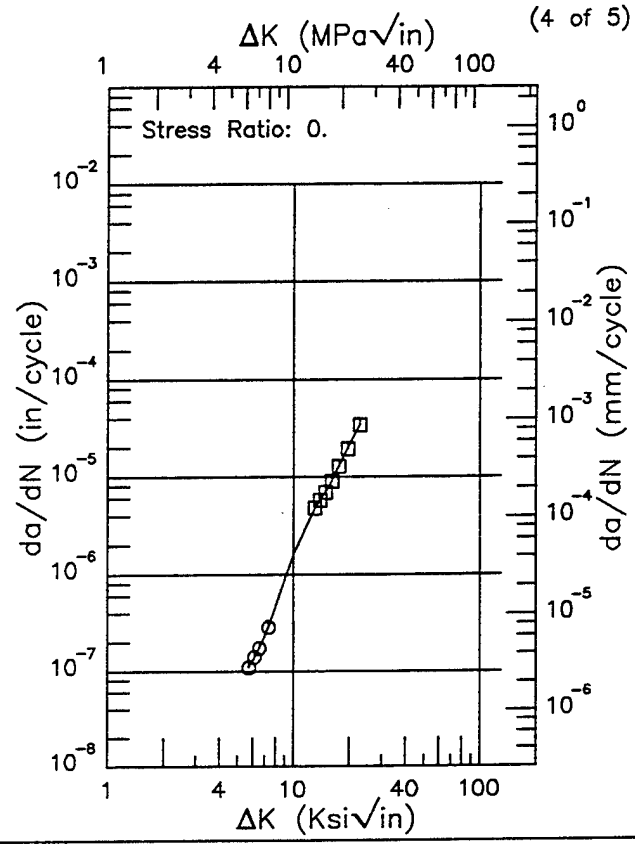
ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.68 (min)	0.114
6.	0.137
7.	0.294
8.	0.662
9.	1.38
10.	2.50
13.	6.90
16.	9.76
20.	21.4
20.90 (max)	27.6

RMS % Error 13.75

Life Prediction Ratio Summary

0. .5 .8 1.25 2.

(4 of 5)



ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.71 (min)	0.113
6.	0.127
7.	0.232
8.	0.465
9.	0.904
10.	1.61
13.	4.71
16.	8.71
20.	21.5
22.72 (max)	33.5

RMS % Error 2.12

Life Prediction Ratio Summary

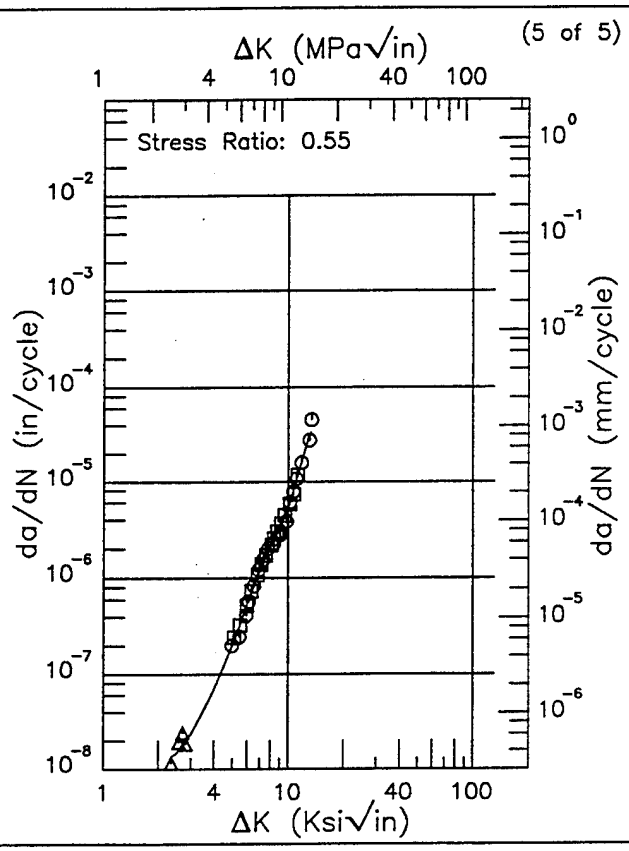
0. .5 .8 1.25 2.

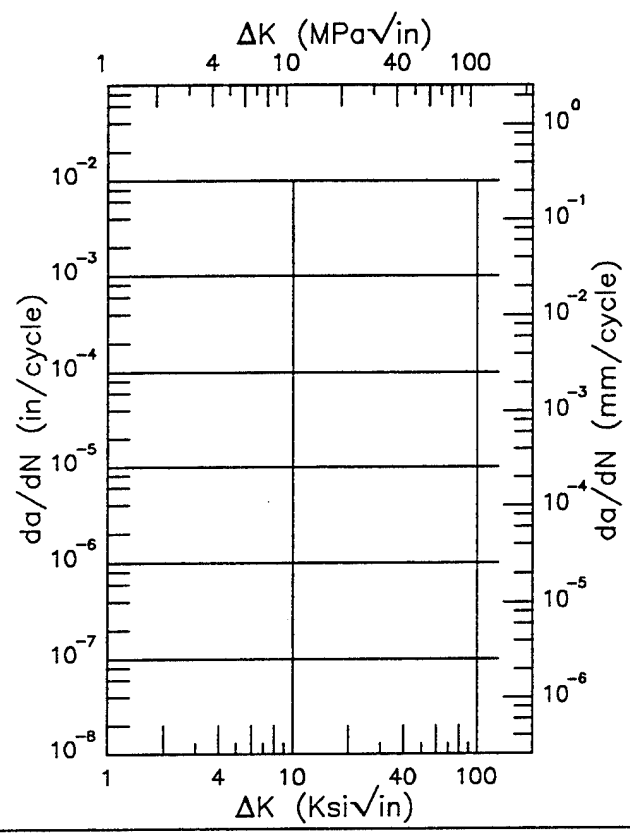
Figure 6.17.3.1.12 (Continued)

Ti–6Al–4V ELI R

Condition/Ht: RA
Form: 0.5 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 8 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.246 – 0.252 in.
Specimen Width: 3.995 – 4.005 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
2.34 (min)	0.0132
2.5	0.0150
3.	0.0238
3.5	0.0402
4.	0.0692
5.	0.201
6.	0.537
7.	1.19
8.	2.12
9.	3.26
10.	5.22
13.	30.9
13.28 (max)	33.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
11.19	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

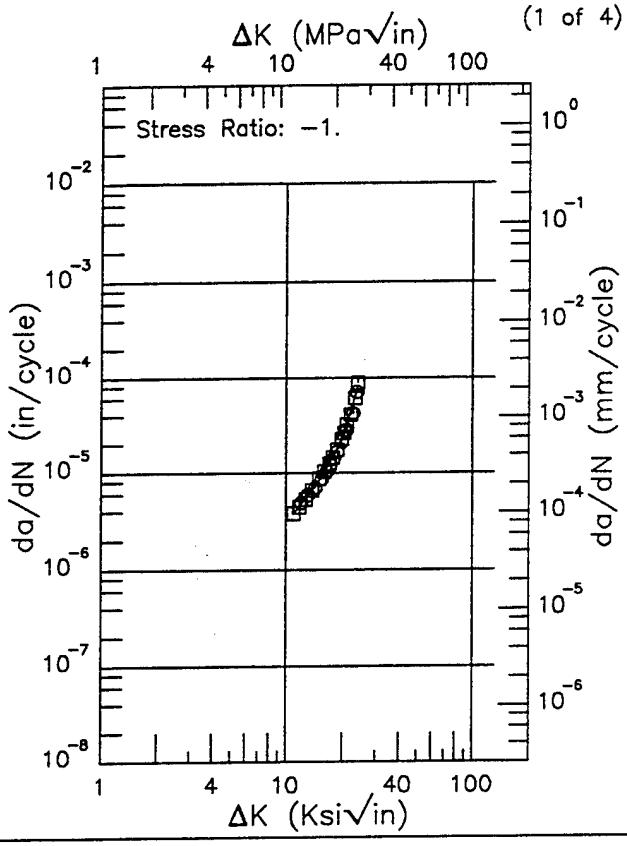
Figure 6.17.3.1.12 (Concluded)

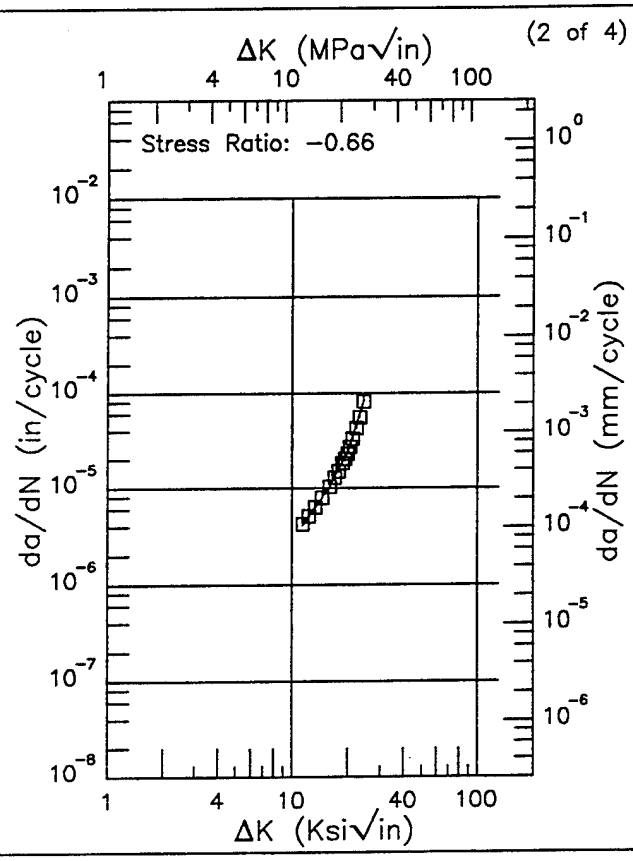
R

Ti–6Al–4V ELI

Condition/Ht: RA
Form: 0.5 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.249 – 0.254 in.
Specimen Width: 3.996 – 4.002 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.90 (min)	3.76
13.	5.71
16.	9.95
20.	23.3
23.96 (max)	76.7

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.44 (min)	4.11
13.	5.83
16.	10.2
20.	24.0
24.13 (max)	78.1

RMS % Error	Life Prediction Ratio Summary
6.23	0. .5 .8 1.25 2.

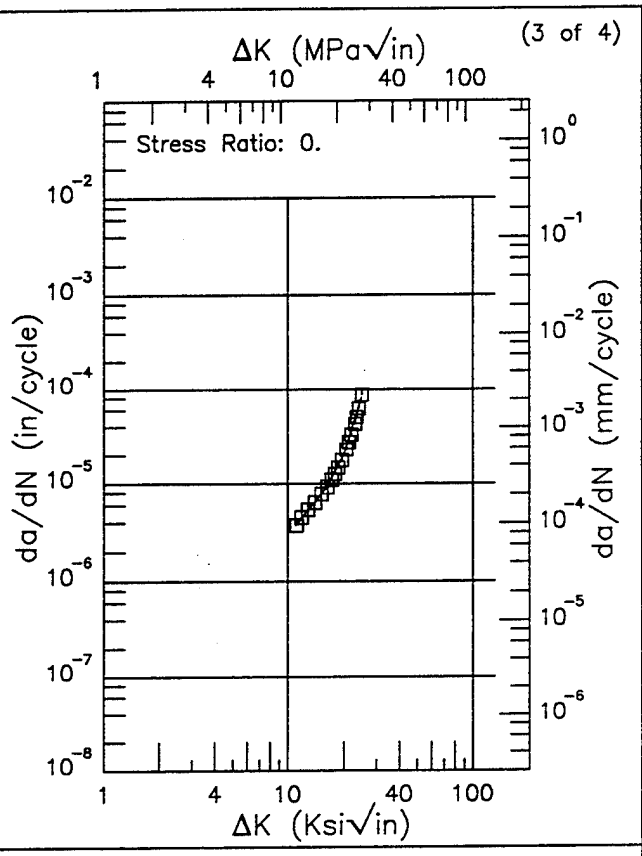
RMS % Error	Life Prediction Ratio Summary
3.94	0. .5 .8 1.25 2.

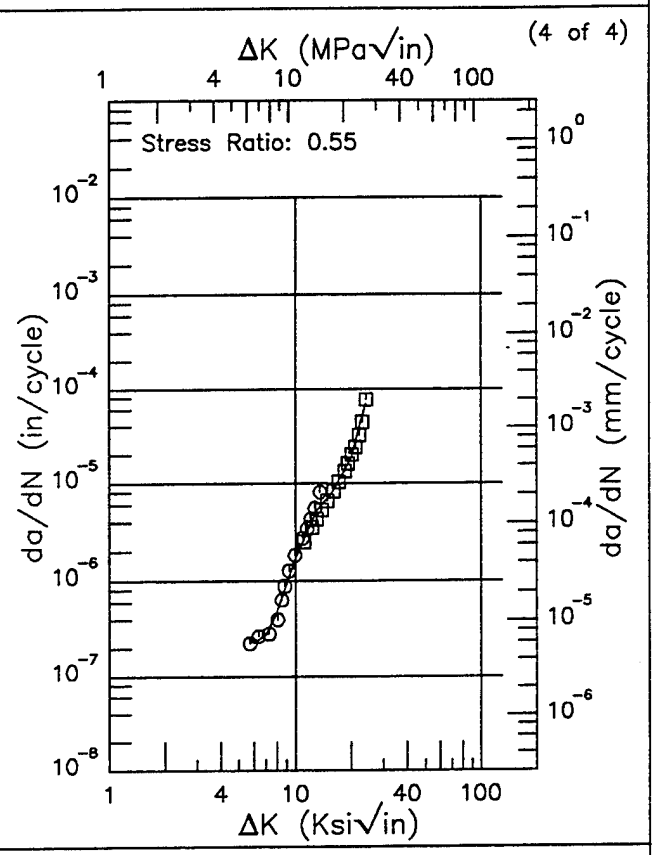
Figure 6.17.3.1.13

Ti–6Al–4V ELI R

Condition/Ht: RA
Form: 0.5 in. Plate
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 10 Hz
Environment: LAB AIR; RT

Yield Strength:
Ult. Strength:
Specimen Thk: 0.249 – 0.254 in.
Specimen Width: 3.996 – 4.002 in.
Ref: NC005





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
11.07 (min)	3.73
13.	5.50
16.	8.98
20.	20.3
24.82 (max)	82.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
5.70 (min)	0.249
6.	0.230
7.	0.280
8.	0.488
9.	0.931
10.	1.71
13.	5.25
16.	8.32
20.	18.6
24.00 (max)	69.6

RMS % Error	Life Prediction Ratio Summary
5.19	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
13.21	0. .5 .8 1.25 2.

Figure 6.17.3.1.13 (Concluded)

TABLE 6.17.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-4V (ELI)

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Reference
						Design	Width (in)	Thick (in)							
1800°F 1hr Helium Cool	P	R.T.	T-S	115.2	3.5% NaCl	CANT*	1	0.5	1	---	112	84+	---	1967	70931

+ specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

* asterisk in specimen design column indicates that specimens are side-grooved

TABLE 6.18.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	BETA ANNEAL 1810F 1HR ARGON COOL	---	---	---	54.3	2.	3	---	---	---
	BETA ANNEAL & STOA-1800F 0.5HR AC 1575F 0.5HR WQ 1050F 8HR AC	50.1	1.8	2	---	---	---	---	---	---
	DUPLEX ANNEAL	---	---	---	65.1	2.	3	---	---	---
	MA	---	---	---	35.	5.2	4	---	---	---
	STA - 1675F 0.25HR WQ 1100F 4HR AC	---	---	---	34.1	3.8	3	---	---	---
	STOA - 1700F 1HR WQ 1400F 1HR AC	42.9	1.2	3	46.1	3.1	4	---	---	---
Forging	MA	58.6	2.7	3	---	---	---	---	---	---
	STA - 1600F 0.5HR WQ 1000F 6HR AC	30.8	0.7	3	---	---	---	---	---	---
Billet	MA	52.3	6.4	4	---	---	---	---	---	---
	MA 1000F 2HR AC	57.1	2.2	2	---	---	---	---	---	---
	STOA - 1700F 1HR WQ 1400F 1HR AC	62.8	6.9	4	57.	3.7	4	---	---	---

TABLE 6.18.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: L-S **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	10			2.92	31.72		

TABLE 6.18.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: L-S **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	0.1			1.94	8.89		
		0.1	10			2.53	7.63		

TABLE 6.18.1.2.3

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	1			2.19	33.78		
		0.1	20		0.22	3.05	19.49		

TABLE 6.18.1.2.4

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Dry Argon**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA	FORGING	0.02	1				10	674.14	

TABLE 6.18.1.2.5

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6A:-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	1			1.64	15.12	394.82	
		0.1	20		0.11	1.7	13.83		

TABLE 6.18.1.2.6

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA	EXTRUSION	0.02	0.1-10			0.43	8		
		0.02	20		0.05	0.65			

TABLE 6.18.1.2.7

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: T-S **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle)					
				ΔK Level ($Ksi\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
BA	PLATE	0.1	0.1			1.94			
STOA	PLATE	0.1	1			1.3	100.49		

TABLE 6.18.1.2.8

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: T-S **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	0.1			0.88	39.8		
		0.5	0.1			1.83	48.78		

TABLE 6.18.1.2.9

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: 3.5% NaCl**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	0.1			2.38	26.43		

TABLE 6.18.1.2.10

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: T-L **ENVIRONMENT: H.H.A.**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
STOA	PLATE	0.1	10			0.73	5.98	42.31	
		0.1	10			2.16	12.37		
		0.5	10		0.33	2.37	44.01		

TABLE 6.18.1.2.11

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: UNSPECIFIED **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK Level (*Ksi√in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
RA (Interstitial Oxygen = 0.08%)	UNSPECIFIED						6.34	87.88	

TABLE 6.18.1.2.12

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-6Al-6V-2Sn AT ROOM TEMPERATURE

ORIENTATION: UNSPECIFIED **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi√in*)					
				2.5	5.0	10.0	20.0	50.0	100.0
MA (Interstitial Oxygen = 0.16%)	UNSPECIFIED						12.24		

TABLE 6.18.2.1

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1650F 1 HR WQ 1050F 1 HR AC	Forging	4.50	-320	L-C	270.0	0.501	0.250	NB	0.122	0.02	22.60	23.6	1.3	1965	84316
		4.50			270.0	0.998	0.501	NB	0.193	0.02	24.50			1965	84316
1650F 1 HR WQ 1050F 1 HR AC	Forging	4.50	R.T.	L-C	184.0	0.501	0.250	NB	0.139	0.09	34.30	31.2	2.2	1965	84316
		4.50			184.0	0.501	0.250	NB	0.132	0.07	30.90			1965	84316
		4.50			184.0	0.998	0.501	NB	0.191	0.06	27.80			1965	84316
		4.50			184.0	0.998	0.501	NB	0.301	0.07	31.40			1965	84316
		4.50			184.0	0.501	0.251	NB	0.177	0.07	30.40			1965	84316
		4.50			184.0	0.998	0.502	NB	0.274	0.08	32.40			1965	84316
1675F 2 HR AC 1600F HR FC	Plate	2.00	R.T.	---	150.0	2.500	1.250	CT	1.250	0.34	55.00	53.8	1.8	1973	90584 (1)
		2.00			150.0	2.500	1.250	CT	1.250	0.30	52.50			1973	90584 (1)
1675F 2 HR AC 1600F HR FC	Forging	---	R.T.	---	138.0	2.500	1.250	CT	1.250	0.36	52.70	55.8	4.4	1973	90584
		---			138.0	2.500	1.250	CT	1.250	0.46	58.90			1973	90584
1675F 2 HR AC 1600F HR FC	Forged Bar	1.50	R.T.	---	150.0	2.500	1.250	CT	1.250	0.43	62.20	60.2	2.8	1973	90584
		1.50			150.0	2.500	1.250	CT	1.250	0.38	58.20			1973	90584
ANNEAL-COARSE GRAIN 1350F 2 HR AC	Forging	1.00	R.T.	---	143.0	2.000	1.000	CT	1.000	0.76	78.80	70.1	6.6	1974	88962
		1.00			143.0	2.000	1.000	CT	1.000	0.48	62.80			1974	88962
		1.00			143.0	2.000	1.000	CT	1.000	0.52	65.00			1974	88962
		1.00			143.0	2.000	1.000	CT	1.000	0.70	75.60			1974	88962
		1.00			143.0	2.000	1.000	CT	1.000	0.52	65.00			1974	88962
		1.00			143.0	2.000	1.000	CT	1.000	0.65	73.20			1974	88962

NOTES: (1) COMPOSITION(WT PERCENT) 5.6Al, 5.4V, 2.0 Sn, 0.026C, 0.57Fe, 0.014N, 0.084H, 0.18O, 0.50Cu

TABLE 6.18.2.1 (CONTINUED)

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEAL-FINE GRAIN - 1350F 2 HR AC	Forging	6.00	R.T.	---	148.0	2.000	1.000	CT	1.000	0.34	54.60	54.0	2.1	1974	88962
		6.00			148.0	2.000	1.000	CT	1.000	0.34	54.40			1974	88962
		6.00			148.0	2.000	1.000	CT	1.000	0.36	56.60			1974	88962
		6.00			148.0	2.000	1.000	CT	1.000	0.29	50.30			1974	88962
		6.00			148.0	2.000	1.000	CT	1.000	0.34	54.40			1974	88962
		6.00			148.0	2.000	1.000	CT	1.000	0.33	53.80			1974	88962
ANNEALED 10-20% PRIMARY ALPHA ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	145.0	2.000	1.000	CT	1.000	0.31	51.30	50.9	0.6	1974	88962
		2.50			145.0	2.000	1.000	CT	1.000	0.30	50.40			1974	88962
ANNEALED 40-50% PRIMARY ALPHA ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	149.0	2.000	1.000	CT	1.000	0.28	49.40	48.8	0.9	1974	88962
		2.50			149.0	2.000	1.000	CT	1.000	0.26	48.10			1974	88962
BB AB FIN-10 BETA BLOCKED ALPHA-BETA FINISHED 10% REDUCTION, SOLUTION TREATED & OVERAGED 1650F 1 HR WQ 1300F 2 HR AC	Forging	2.50	R.T.	---	148.0	2.000	1.000	CT	1.000	0.67	76.60	72.6	5.6	1974	88962
		2.50			148.0	2.000	1.000	CT	1.000	0.54	68.70			1974	88962
BB AB FIN-10MA BETA BLOCKED ALPH-BETA FINISHED 10% REDUCTION MILL ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	147.0	2.000	1.000	CT	1.000	0.60	71.80	77.0	6.8	1974	88962
		2.50			147.0	2.000	1.000	CT	1.000	0.83	84.70			1974	88962
		2.50			147.0	2.000	1.000	CT	1.000	0.64	74.60			1974	88962
BB AB FIN-30 BETA BLOCKED ALPHA-BETA FINISHED 30% REDUCTION SOLUTION	Forging	2.50	R.T.	---	148.0	2.000	1.000	CT	1.000	0.47	64.30	61.6	2.4	1974	88962
		2.50			148.0	2.000	1.000	CT	1.000	0.42	60.80			1974	88962
		2.50			148.0	2.000	1.000	CT	1.000	0.40	59.60			1974	88962

TABLE 6.18.2.1 (CONTINUED)

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
BB AB FIN-30MA BETA BLOCKED ALPHA-BETA FINISHED 30% REDUCTION MILL ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	145.0	2.000	1.000	CT	1.000	0.51	65.40	64.7	0.6	1974	88962
		2.50			145.0	2.000	1.000	CT	1.000	0.49	64.20			1974	88962
		2.50			145.0	2.000	1.000	CT	1.000	0.49	64.40			1974	88962
BB B FIN-10 BETA BLOCKED BETA FINISHED 10% REDUCTION SOLUTION TREATED & OVERAGED 1650F 1 HR WQ 1300F 2 HR AC	Forging	2.50	R.T.	---	140.0	2.000	1.000	CT	1.000	0.69	73.60	72.1	2.1	1974	88962
		2.50			140.0	2.000	1.000	CT	1.000	0.64	70.70			1974	88962
BB B FIN-10MA BETA BLOCKED BETA FINISHED 10% REDUCTION MILL ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	136.0	2.000	1.000	CT	1.000	0.69	71.70	70.5	1.0	1974	88962
		2.50			136.0	2.000	1.000	CT	1.000	0.66	70.20			1974	88962
		2.50			136.0	2.000	1.000	CT	1.000	0.66	69.70			1974	88962
BETA ANNEAL	Plate	1.00	R.T.	T-L	138.4	2.550	1.000	WOL-CT EQ.	---	0.73	74.60	---	---	1977	JEM01
BETA ANNEAL 1810F 1 HR ARGON COOL	Plate	0.50	R.T.	T-L	139.8	1.000	0.447	CT	0.568	0.36	53.20	54.3	2.0	1971	83222
		0.50			139.8	1.000	0.446	CT	0.558	0.36	53.00			1971	83222
		0.50			139.8	1.000	0.447	CT	0.513	0.41	56.60			1971	83222
BETA ANNEAL & STOA-1800F 0.5 HR AC 1575F 0.5 HR WQ 1050F 8 HR AC	Plate	0.62	R.T.	L-T	156.0	2.000	0.626	CT	1.000	0.24	48.80	50.1	1.8	1974	88186
		0.62			156.0	2.000	0.626	CT	1.000	0.27	51.30			1974	88186

TABLE 6.18.2.1 (CONTINUED)

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * √in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
BF AB FOR-ANN BETA FLECTED ALPHA-BETA FORGED ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	138.0	2.000	1.000	CT	1.000	0.82	79.30	75.3	3.7	1974	88962
		2.50			138.0	2.000	1.000	CT	1.000	0.73	74.50			1974	88962
		2.50			138.0	2.000	1.000	CT	1.000	0.68	72.10			1974	88962
BF B FOR-ANN BETA FLECTED BETA FORGED ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	136.0	2.000	1.000	CT	1.000	0.74	73.90	74.1	0.5	1974	88962
		2.50			136.0	2.000	1.000	CT	1.000	0.75	74.70			1974	88962
		2.50			136.0	2.000	1.000	CT	1.000	0.74	73.80			1974	88962
BF LAB FOR-ANN BETA FLECTED LOW ALPHA-BETA FORGED (1500F) ANNEALED 1350F 2 HR AC	Forging	2.50	R.T.	---	141.0	2.000	1.000	CT	1.000	0.38	55.20	56.3	1.6	1974	88962
		2.50			141.0	2.000	1.000	CT	1.000	0.39	55.70			1974	88962
		2.50			141.0	2.000	1.000	CT	1.000	0.42	58.10			1974	88962
DUPLEX ANNEAL	Plate	0.50	R.T.	T-L	150.5	2.000	0.495	CT	1.056	0.50	67.40	65.1	2.0	1971	83222 (1)
		0.50			150.5	2.000	0.500	CT	0.988	0.46	64.50			1971	83222 (1)
		0.50			150.5	2.000	0.500	CT	1.078	0.44	63.50			1971	83222 (1)
MILL ANNEALED	Plate	2.00	R.T.	---	157.0	2.500	1.250	CT	1.250	0.18	42.30	42.3	0.0	1973	90584 (2)
		2.00			157.0	2.500	1.250	CT	1.250	0.18	42.30			1973	90584 (2)
MILL ANNEALED	Plate	1.00	R.T.	T-L	151.3	2.550	1.000	WOL-CT EQ.	---	0.20	42.80	35.0	5.2	1977	JEM01
		0.50			163.3	1.000	0.495	CT	0.522	0.09	32.00			1971	83222
		0.50			163.3	1.000	0.495	CT	0.517	0.10	33.20			1971	83222
		0.50			163.3	1.000	0.494	CT	0.537	0.09	32.10			1971	83222

NOTES: (1) 1700F 1HR ARGON COOL 1400F 1HR ARGON COOL
(2) COMPOSITION(WT PERCENT) 5.6Al, 5.4V, 2.0 Sn, 0.026C, 0.57Fe, 0.014N, 0.084H, 0.18O, 0.50Cu

TABLE 6.18.2.1 (CONTINUED)

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi * $\sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
MILL ANNEALED	Forging	3.80	-65	L-T	169.0	2.498	1.008	CT	1.299	0.19	47.20	44.2	5.7	1973	90589
		3.80			169.0	2.502	1.007	CT	1.312	0.19	47.70			1973	90589
		3.80			169.0	2.503	1.003	CT	1.297	0.12	37.60			1973	90589
MILL ANNEALED	Forging	---	R.T.	---	144.0	2.500	1.250	CT	1.250	0.37	55.60	55.7	0.1	1973	90584
		---			144.0	2.500	1.250	CT	1.250	0.37	55.70			1973	90584
MILL ANNEALED	Forging	3.80	R.T.	L-T	149.0	2.499	0.999	CT	1.299	0.43	61.70	58.6	2.7	1973	90589
		3.80			149.0	2.495	0.995	CT	1.301	0.37	57.30			1973	90589
		3.80			149.0	2.501	1.006	CT	1.300	0.36	56.90			1973	90589
MILL ANNEALED	Forged Bar	1.50	R.T.	---	153.0	2.500	1.250	CT	1.250	0.20	43.10	---	---	1973	90584
MILL ANNEALED	Billet	2.20	R.T.	L-T	144.0	2.500	1.251	CT	1.332	0.37	55.60	52.3	6.4	1971	84360
		2.20			144.0	2.507	1.243	CT	1.262	0.42	58.90			1971	84360
		2.20			146.0	2.500	1.245	CT	1.216	0.30	50.40			1971	84360
		2.20			146.0	2.495	1.253	CT	1.297	0.23	44.30			1971	84360
MILL ANNEALED 1000F 2 HR AC	Billet	2.20	R.T.	L-T	155.0	2.495	1.255	CT	1.295	0.32	55.50	57.1	2.2	1971	84360
		2.20			155.0	2.500	1.254	CT	1.254	0.36	58.60			1971	84360
RECRYSTALLIZE ANNEAL	Plate	1.00	R.T.	T-L	150.0	2.550	1.000	WOL-CT EQ.	---	0.45	63.70	---	---	1977	JEM01
STA-1600F .5HR WQ 1000F 6 HR AC	Forging	3.80	-65	L-T	209.0	2.499	1.005	CT	1.267	0.05	28.80	28.4	0.6	1973	90589
		3.80			209.0	2.496	1.007	CT	1.283	0.04	27.80			1973	90589
		3.80			209.0	2.494	1.010	CT	1.326	0.05	28.70			1973	90589

TABLE 6.18.2.1 (CONTINUED)

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 \cdot (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi $\cdot \sqrt{in.}$)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
STA-1600F .5 HR WQ 1000F 6 HR AC	Forging	3.80	R.T.	L-T	184.0	2.501	1.007	CT	1.278	0.07	30.60	30.8	0.7	1973	90589
		3.80			184.0	2.498	1.005	CT	1.290	0.07	31.60			1973	90589
		3.80			184.0	2.502	1.006	CT	1.296	0.07	30.20			1973	90589
STA-1600F .5 HR WQ 1000F 6 HR AC	Forging	3.80	300	L-T	165.0	2.497	1.015	CT	1.278	0.27	54.20	53.0	3.2	1973	90589
		3.80			165.0	2.501	1.001	CT	1.292	0.28	55.50			1973	90589
		3.80			165.0	2.499	1.009	CT	1.272	0.22	49.40			1973	90589
STA-1650F 0.5 HR WQ 1050F 24 HR AC	Forging	---	R.T.	L-C	188.0	0.998	0.500	CT	0.508	0.04	24.60	25.1	0.6	1972	86494 (1)
		---			188.0	0.997	0.498	CT	0.532	0.05	25.50			1972	86494 (1)
		---			188.0	0.994	0.500	CT	0.507	0.04	24.50			1972	86494 (1)
		---			188.0	1.000	0.499	CT	0.556	0.05	25.60			1972	86494 (1)
STA-1650F 0.5 HR WQ 1050F 24 HR AC	Forging	---	R.T.	C-L	188.0	1.005	0.500	CT	0.517	0.06	29.10	26.7	2.1	1972	86494 (1)
		---			188.0	1.001	0.500	CT	0.505	0.05	25.30			1972	86494 (1)
		---			188.0	1.001	0.500	CT	0.523	0.05	25.60			1972	86494 (1)
STA-1675F 0.25 HR WQ 1100F 4 HR	Plate	1.25	R.T.	T-L	173.3	2.000	0.499	CT	1.138	0.07	29.80	34.1	3.8	1971	83222
		1.25			173.3	2.000	0.499	CT	1.046	0.10	35.50			1971	83222
		1.25			173.3	2.000	0.499	CT	1.080	0.11	37.00			1971	83222
STOA-1600F 1.5 HR WQ 1250F 6 HR AC	Extrusion	3.00	R.T.	C-R	143.0	1.499	0.749	CT	0.783	0.36	54.50	53.6	1.4	1973	87230 (2)
		3.00			143.0	1.496	0.750	CT	0.779	0.36	54.20			1973	87230 (2)
		3.00			143.0	1.488	0.750	CT	0.808	0.33	52.00			1973	87230 (2)
STOA-1650F 1 HR WQ 1300F 2 HR AC	Forging	2.50	R.T.	---	154.0	2.000	1.000	CT	1.000	0.17	40.40	41.0	0.8	1974	88962
		2.50			154.0	2.000	1.000	CT	1.000	0.18	41.60			1974	88962

NOTES: (1) ISOTHERMAL FORGING FOR AIRCRAFT NOSE WHEEL
(2) ALPHA PRECIPITATE IN BETA MATRIX
STRAIGHTNESS OF CRACK FRONT MAY NOT MEET ASTM E399-72 REQUIREMENTS

TABLE 6.18.2.1 (CONCLUDED)

TITANIUM Ti-6Al-6V-2Sn K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} (K_{Ic} (Ksi * $\sqrt{in.}$))	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
STOA-1700F 1 HR WQ 1400F 1 HR AC	Plate	0.38	R.T.	L-T	156.0	1.000	0.375	CT	---	0.18	41.90	42.9	1.2	1974	90981
		0.38			156.0	1.000	0.375	CT	---	0.18	42.50			1974	90981
		0.38			156.0	1.000	0.375	CT	---	0.20	44.30			1974	90981
STOA-1700F 1 HR WQ 1400F 1 HR AC	Plate	0.38	R.T.	T-L	160.0	1.000	0.375	CT	---	0.18	42.90	46.1	3.1	1974	90981
		0.38			160.0	1.000	0.375	CT	---	0.19	44.00			1974	90981
		0.38			160.0	1.000	0.375	CT	---	0.24	49.10			1974	90981
		0.38			160.0	1.000	0.375	CT	---	0.23	48.30			1974	90981
STOA-1700F 1 HR WQ 1400F 1 HR AC	Billet	12.00	R.T.	L-T	147.0	2.000	1.020	NB	---	0.33	53.60	62.8	6.9	1974	90981
		12.00			147.0	2.000	1.020	NB	---	0.57	70.40			1974	90981
		12.00			148.0	2.000	1.020	NB	---	0.46	63.70			1974	90981
		12.00			148.0	2.000	1.020	NB	---	0.46	63.40			1974	90981
STOA-1700F 1 HR WQ 1400F 1 HR AC	Billet	12.00	R.T.	T-L	144.0	2.000	1.020	NB	---	0.42	58.80	57.0	3.7	1974	90981
		12.00			144.0	2.000	1.020	NB	---	0.40	58.00			1974	90981
		12.00			145.0	2.000	1.020	NB	---	0.32	51.50			1974	90981
		12.00			145.0	2.000	1.020	NB	---	0.42	59.60			1974	90981

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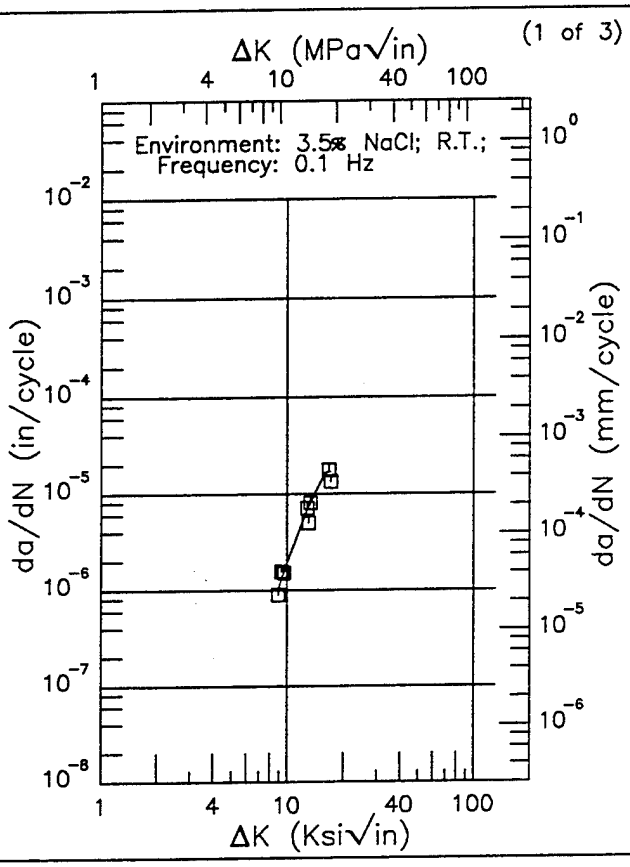
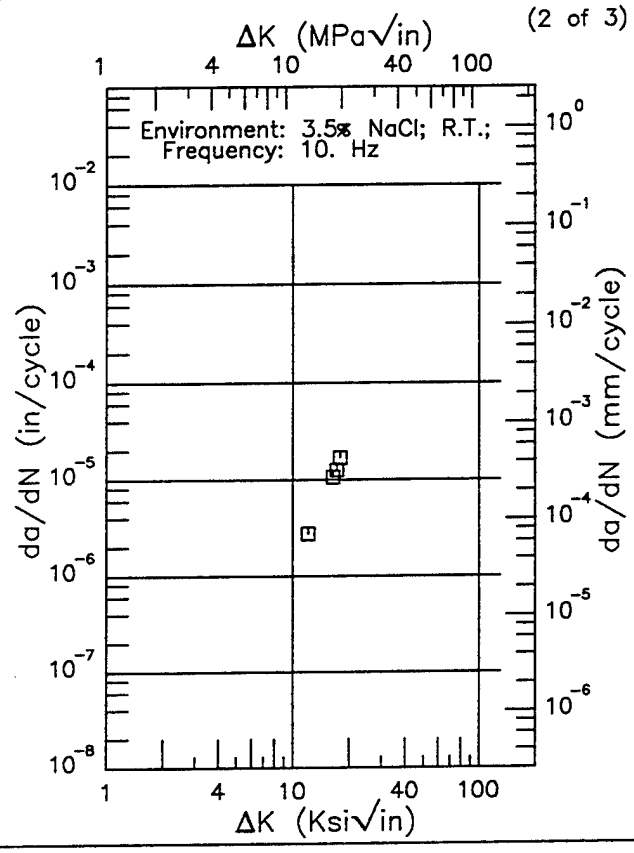
Ti-6Al-6V-2Sn

EF

Condition/Ht: BA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: T-S
Stress Ratio: 0.1

Yield Strength: 130 - 160 ksi
Ult. Strength: 168 ksi
Specimen Thk: 0.375 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.91 (min)	1.01
9.	1.07
10.	1.94
13.	7.24
16.	16.6
17.02 (max)	16.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
16.37	0. .5 .8 1.25 2.

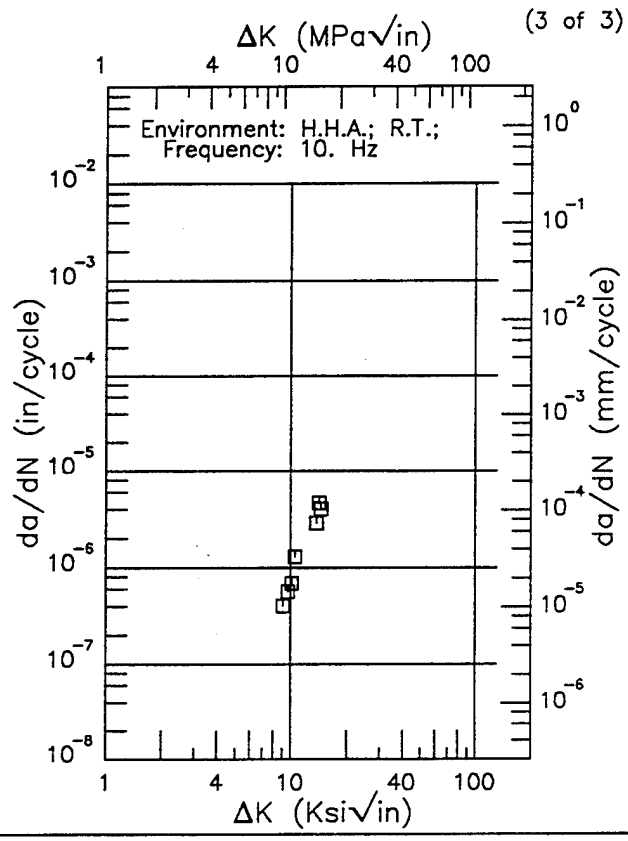
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

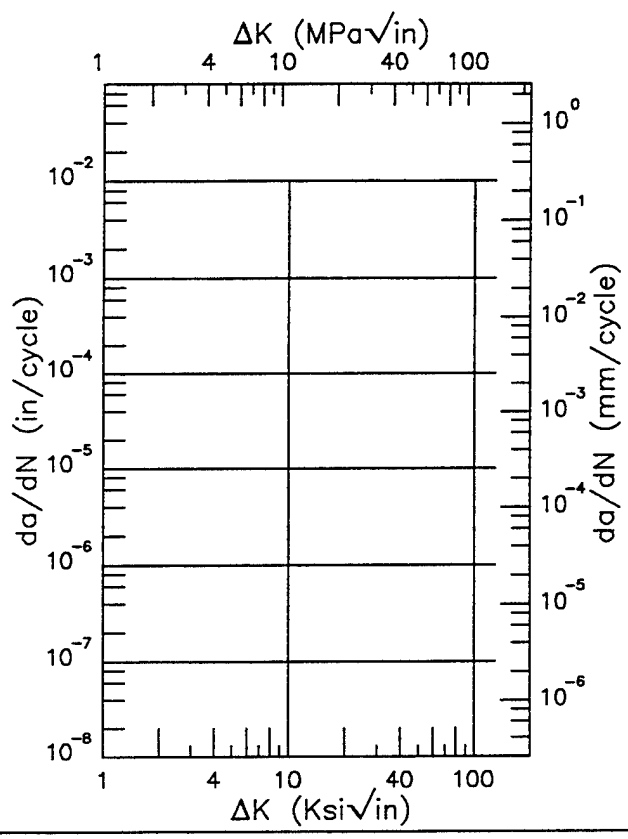
Figure 6.18.3.1.1

Ti–6Al–6V–2Sn EF

Condition/Ht: BA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: T–S
Stress Ratio: 0.1

Yield Strength: 130 – 160 ksi
Ult. Strength: 168 ksi
Specimen Thk: 0.375 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

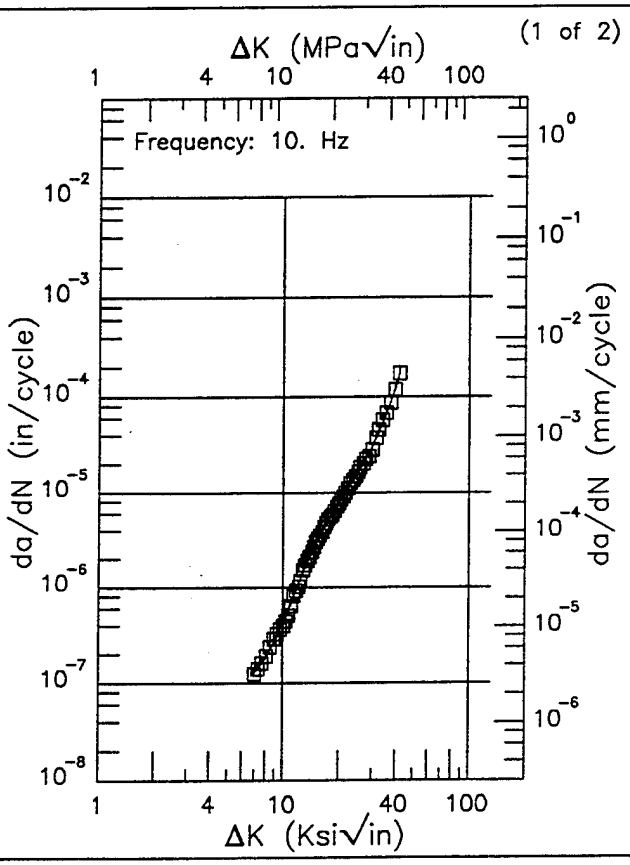
Figure 6.18.3.1.1 (Concluded)

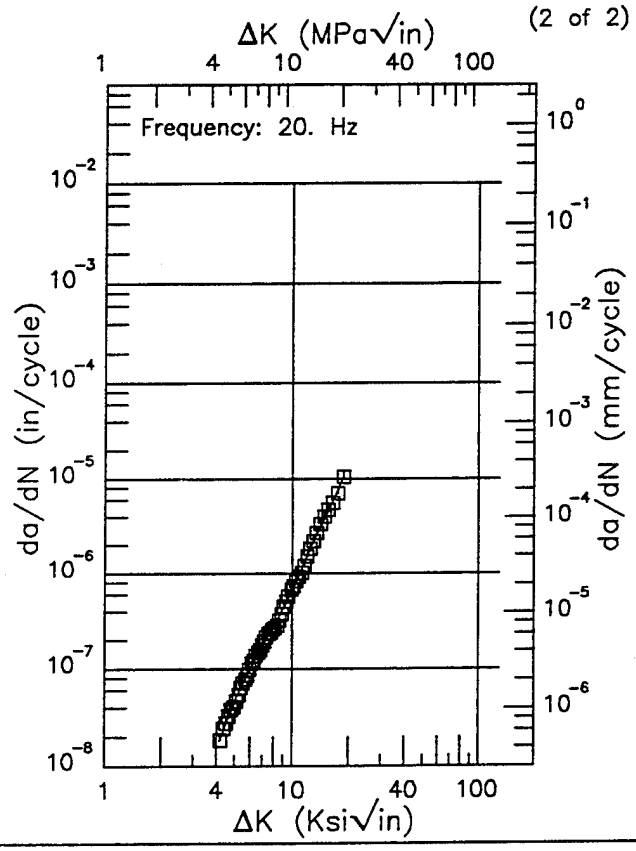
Ti-6Al-6V-2Sn

F

Condition/Ht: MA
Form: Extrusion
Specimen Type: CCP (max load specified)
Orientation: L-T
Stress Ratio: 0.02
Environment: LAB AIR; RT

Yield Strength: 143 ksi
Ult. Strength: 157 ksi
Specimen Thk: 0.081 - 0.082 in.
Specimen Width: 3.509 - 3.519 in.
Ref: MA002





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.99 (min)	0.130
7.	0.130
8.	0.178
9.	0.271
10.	0.426
13.	1.51
16.	3.77
20.	8.00
25.	15.9
30.	30.9
35.	61.9
40.	128.
41.81 (max)	168.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.16 (min)	0.0182
5.	0.0464
6.	0.0988
7.	0.174
8.	0.279
9.	0.431
10.	0.653
13.	2.22
16.	5.10
18.61 (max)	10.4

RMS % Error	Life Prediction Ratio Summary
4.86	0. .5 .8 1.25 2.

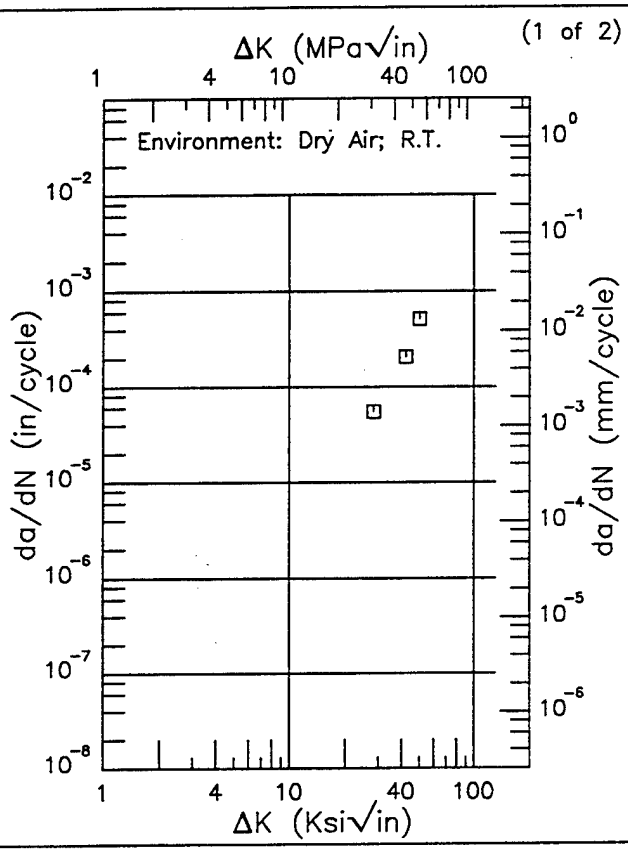
RMS % Error	Life Prediction Ratio Summary
5.05	0. .5 .8 1.25 2.

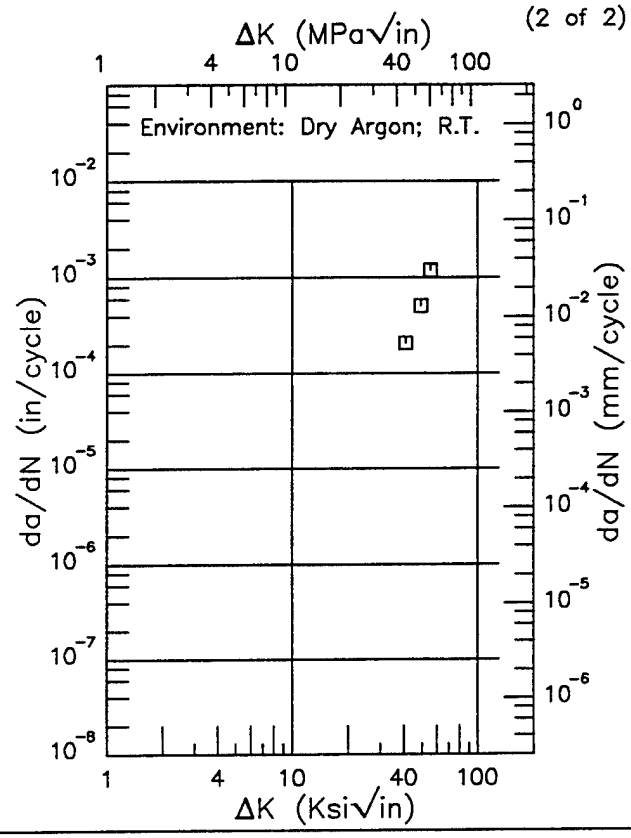
Figure 6.18.3.1.2

Ti–6Al–6V–2Sn E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 0.1 Hz

Yield Strength: 144 ksi
Ult. Strength: 151 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

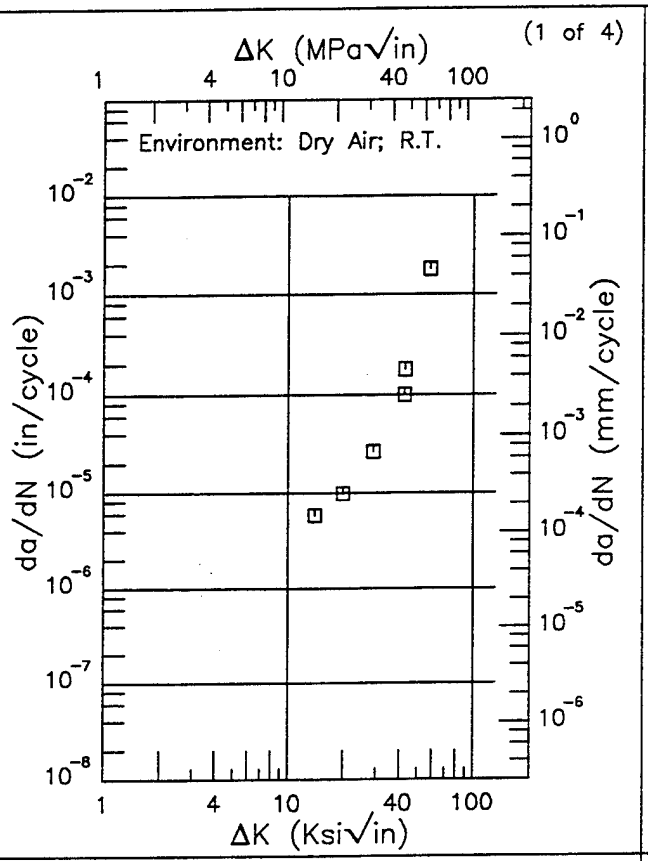
Figure 6.18.3.1.3

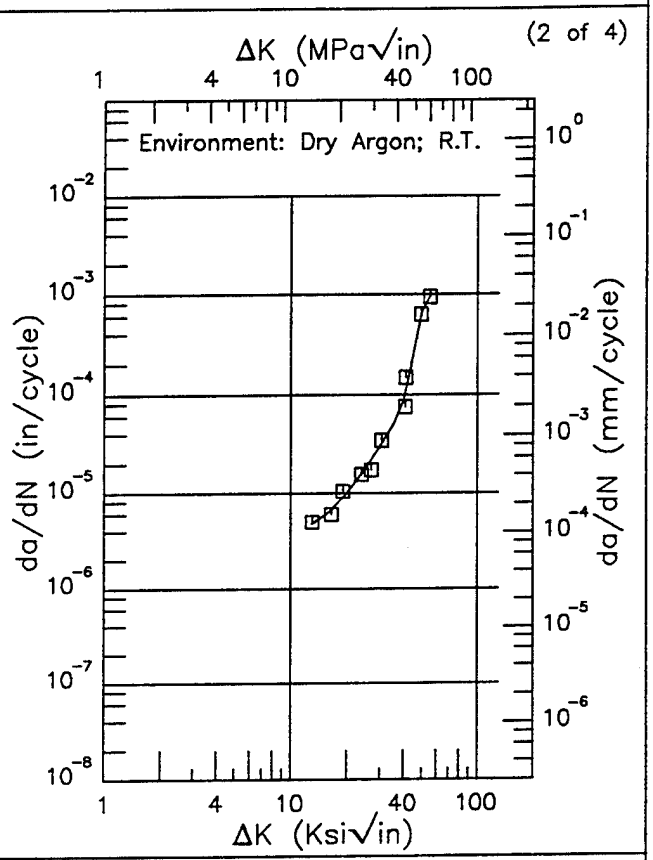
Ti–6Al–6V–2Sn

E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 1 Hz

Yield Strength: 144 – 155 ksi
Ult. Strength: 151 – 164 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.02 (min)	4.81
16.	6.34
20.	10.00
25.	17.7
30.	30.0
35.	48.9
40.	87.2
50.	674.
54.97 (max)	923.

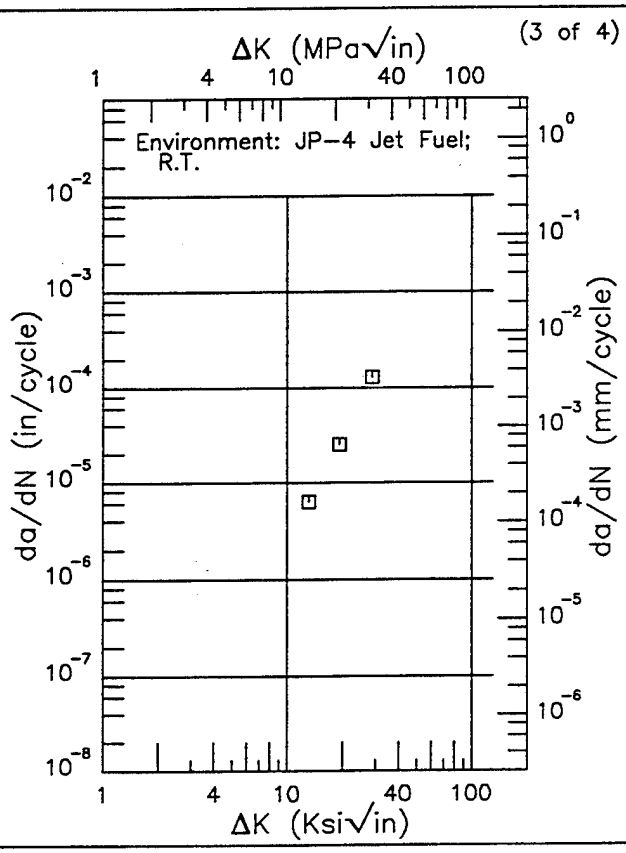
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.	17.35	0. .5 .8 1.25 2.

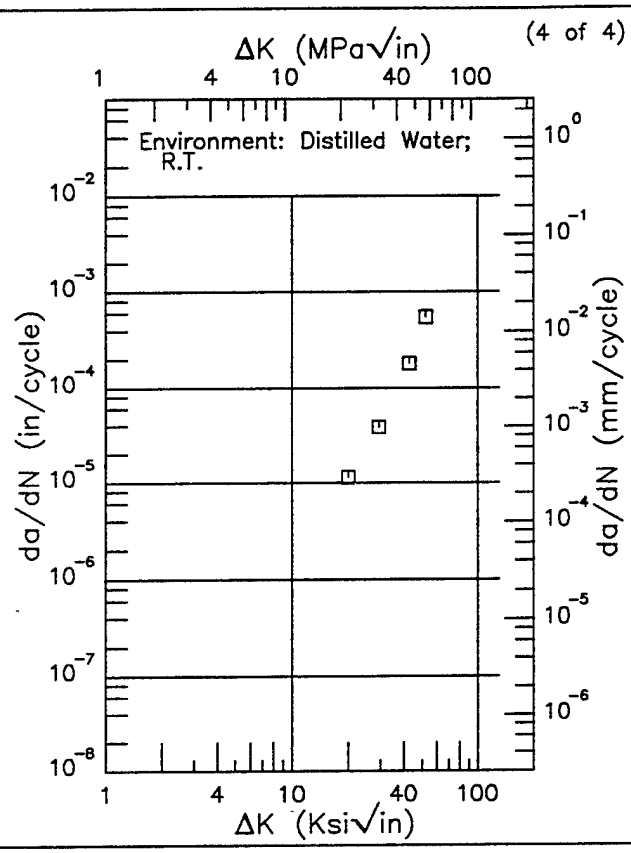
Figure 6.18.3.1.4

Ti–6Al–6V–2Sn E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 1 Hz

Yield Strength: 144 – 155 ksi
Ult. Strength: 151 – 164 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

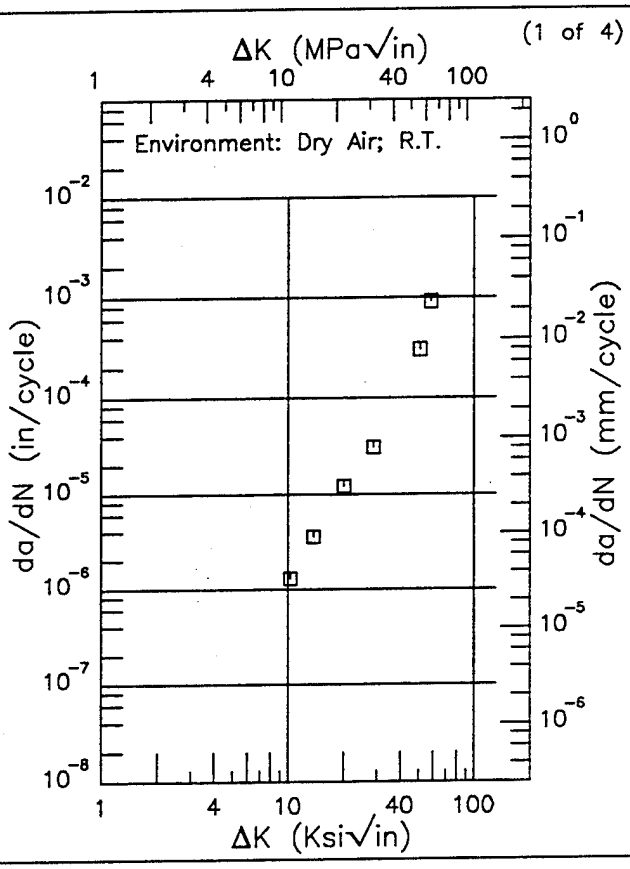
Figure 6.18.3.1.4 (Concluded)

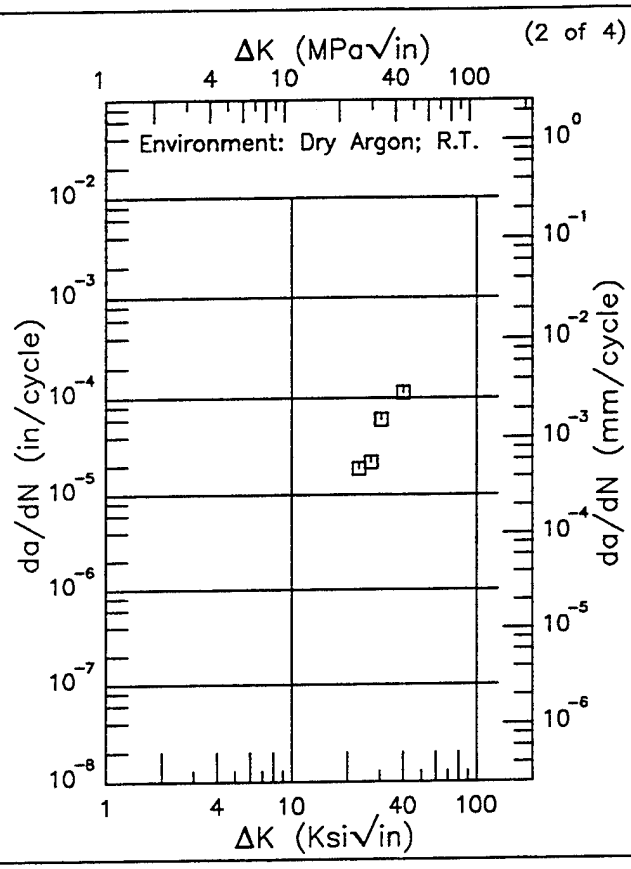
Ti-6Al-6V-2Sn

E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L-T
Stress Ratio: 0.02
Frequency: 10 Hz

Yield Strength: 144 - 155 ksi
Ult. Strength: 151 - 164 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

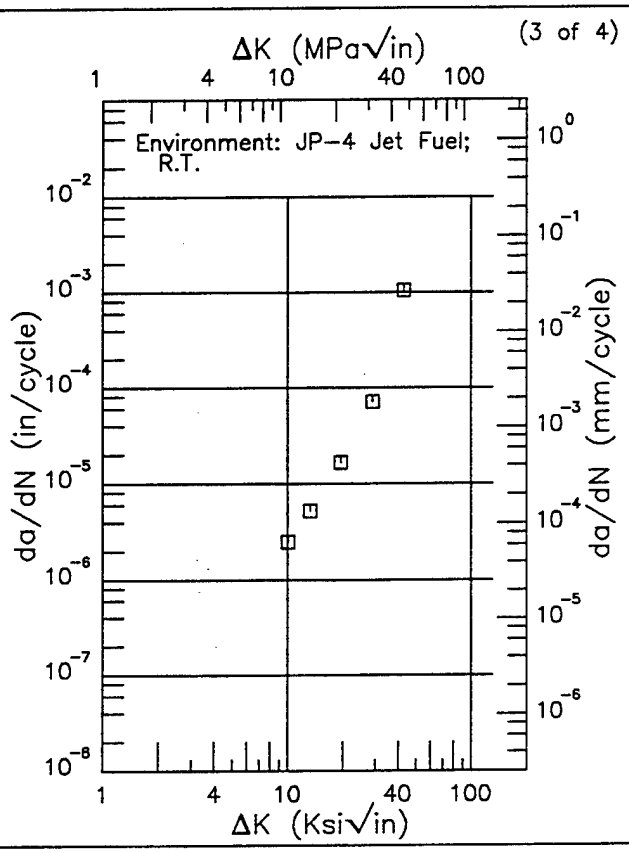
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

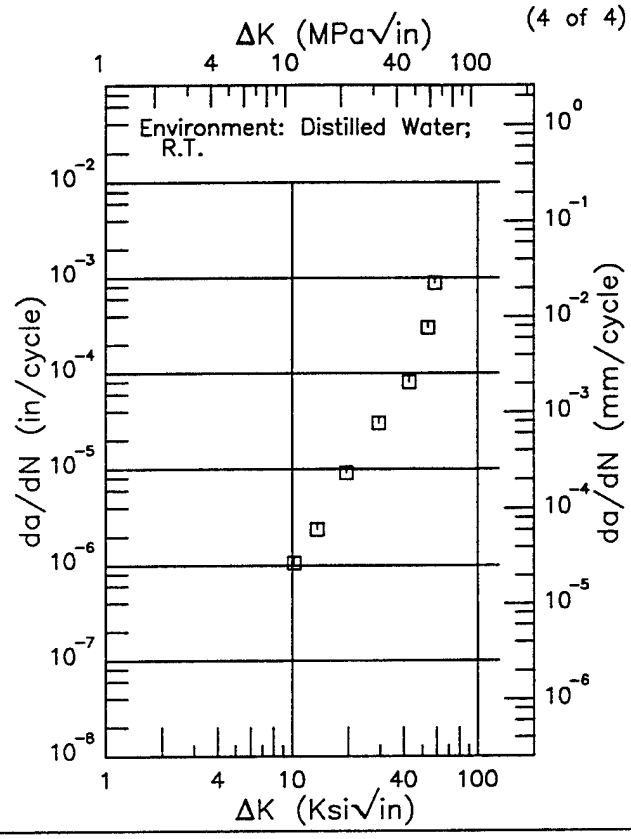
Figure 6.18.3.1.5

Ti–6Al–6V–2Sn E

Condition/Ht: MA
Form: 2 in. Forging
Specimen Type: DCB
Orientation: L–T
Stress Ratio: 0.02
Frequency: 10 Hz

Yield Strength: 144 – 155 ksi
Ult. Strength: 151 – 164 ksi
Specimen Thk: 0.75 in.
Specimen Width: 5.5 in.
Ref: 84360





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

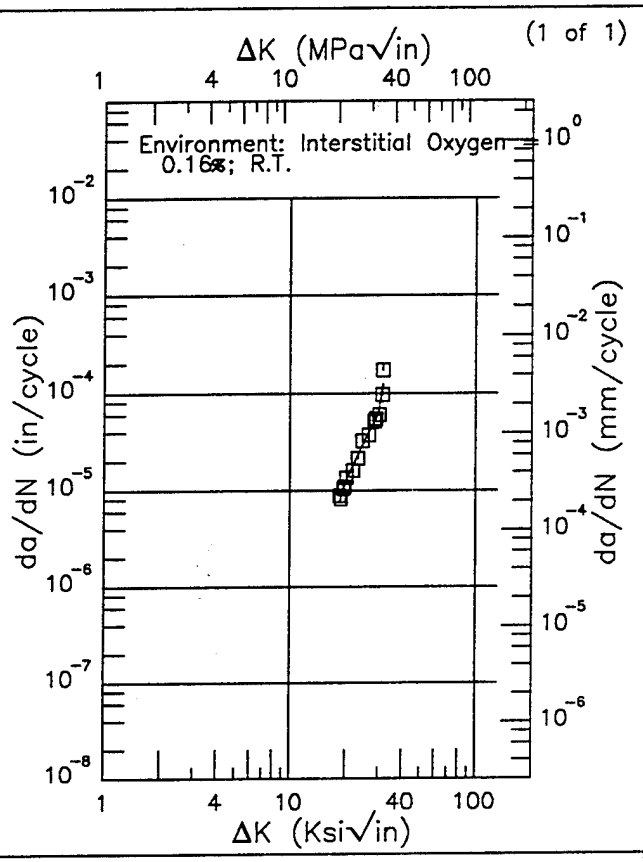
Figure 6.18.3.1.5 (Concluded)

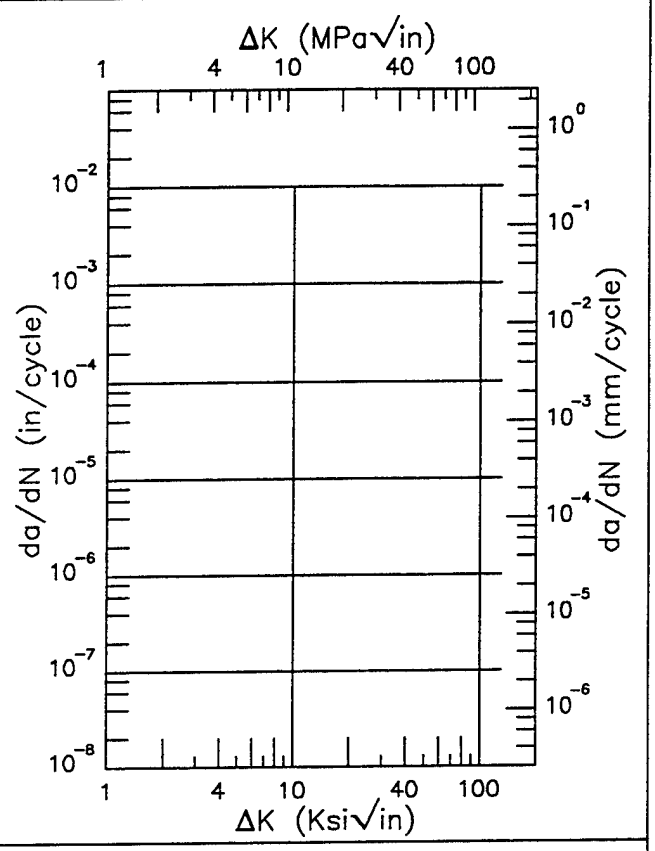
Ti-6Al-6V-2Sn

E

Condition/Ht: MA
Form:
Specimen Type:
Orientation:
Stress Ratio:
Frequency:

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 91945





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.53 (min)	7.83
20.	12.2
25.	31.4
30.	62.8
31.63 (max)	124.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
12.00	0. .5 .8 1.25 2.

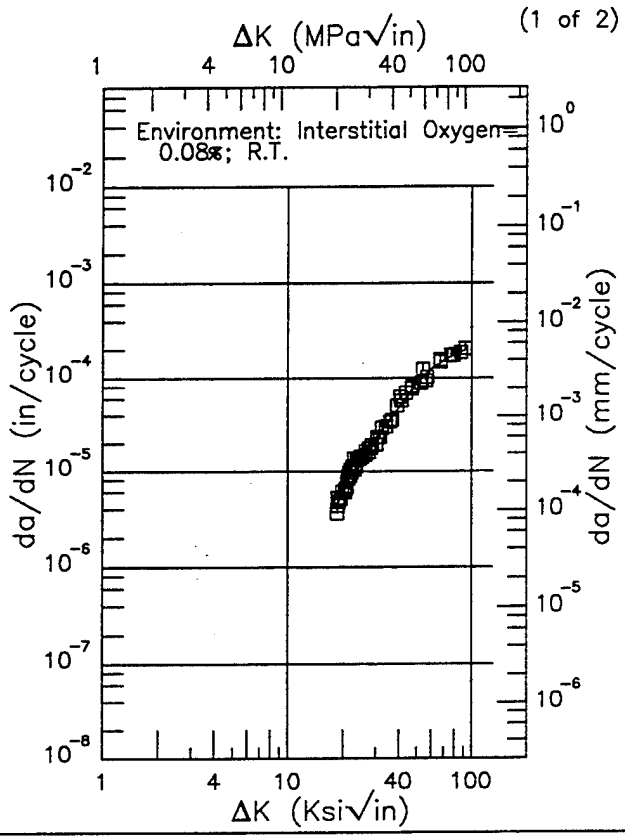
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

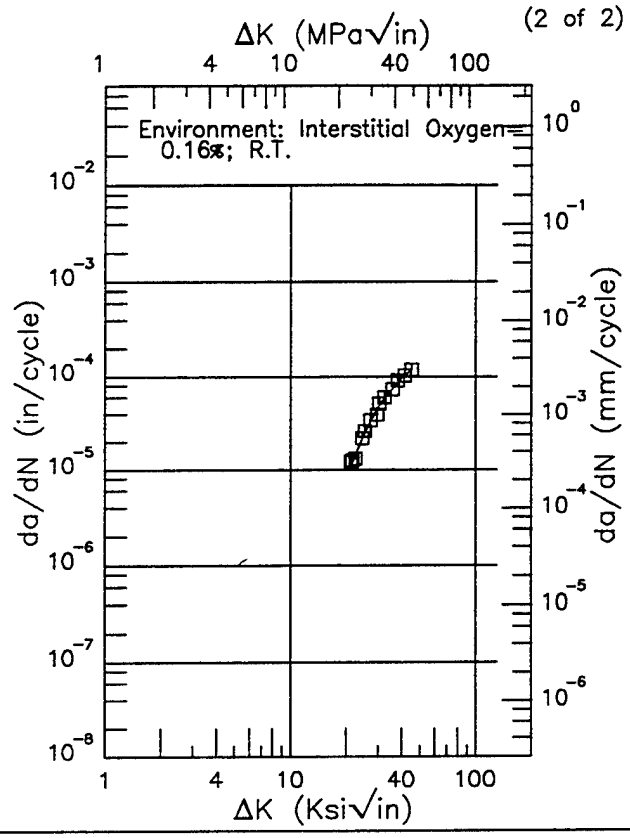
Figure 6.18.3.1.6

Ti–6Al–6V–2Sn E

Condition/Ht: RA
Form:
Specimen Type:
Orientation:
Stress Ratio:
Frequency:

Yield Strength:
Ult. Strength:
Specimen Thk:
Specimen Width:
Ref: 91945





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
18.44 (min)	4.48
20.	6.34
25.	13.7
30.	22.8
35.	34.1
40.	49.0
50.	87.9
60.	124.
70.	151.
80.	177.
90.	195.
91.66 (max)	197.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
21.24 (min)	10.9
25.	23.7
30.	47.1
35.	71.6
40.	97.7
45.04 (max)	116.

RMS % Error	Life Prediction Ratio Summary
11.34	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
6.60	0. .5 .8 1.25 2.

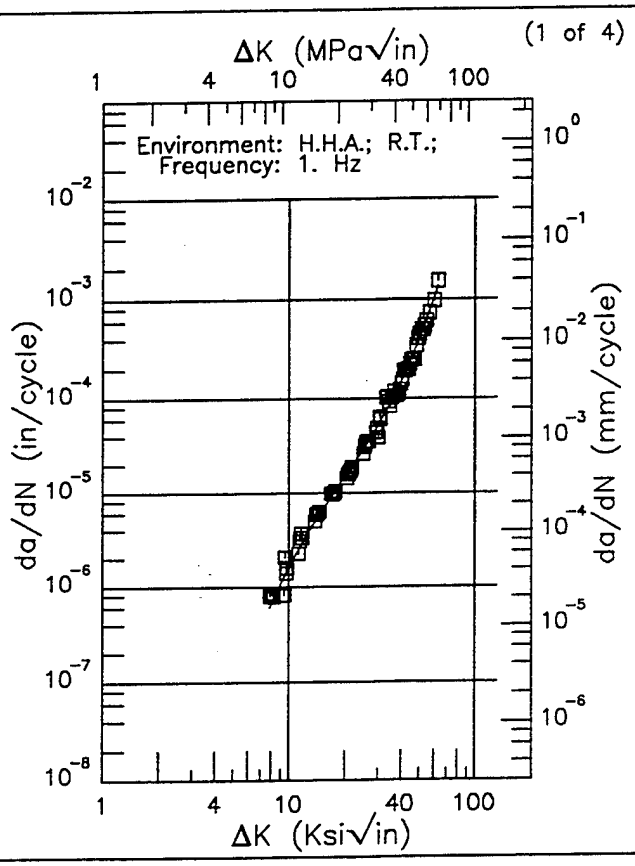
Figure 6.18.3.1.7

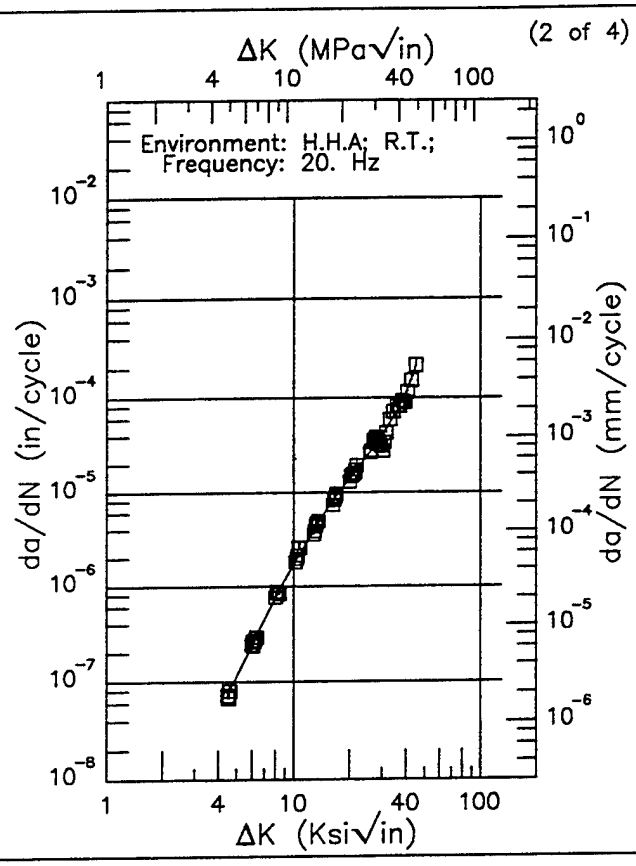
Ti–6Al–6V–2Sn

EF

Condition/Ht: STOA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1

Yield Strength: 160 ksi
Ult. Strength: 170 ksi
Specimen Thk: 0.148 – 0.151 in.
Specimen Width: 3 in.
Ref: 86844





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.86 (min)	0.603
8.	0.653
9.	1.08
10.	1.64
13.	4.11
16.	7.84
20.	15.1
25.	29.4
30.	52.4
35.	89.5
40.	149.
50.	395.
60.	1014.
63.06 (max)	1347.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.47 (min)	0.0703
5.	0.112
6.	0.237
7.	0.440
8.	0.741
9.	1.16
10.	1.70
13.	4.13
16.	7.64
20.	13.8
25.	24.5
30.	40.5
35.	66.0
40.	111.
45.10 (max)	209.

RMS % Error	Life Prediction Ratio Summary
14.78	0. .5 .8 1.25 2.

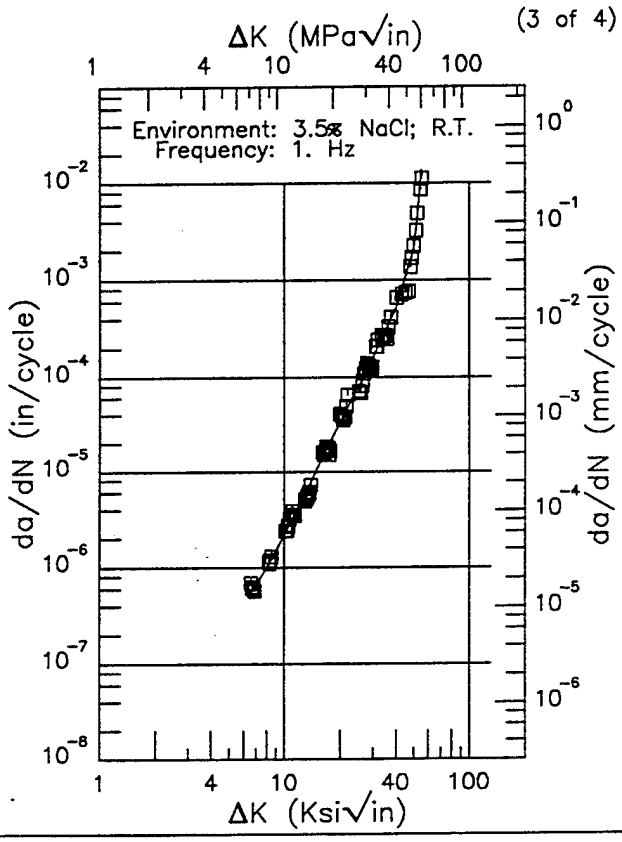
RMS % Error	Life Prediction Ratio Summary
9.62	0. .5 .8 1.25 2.

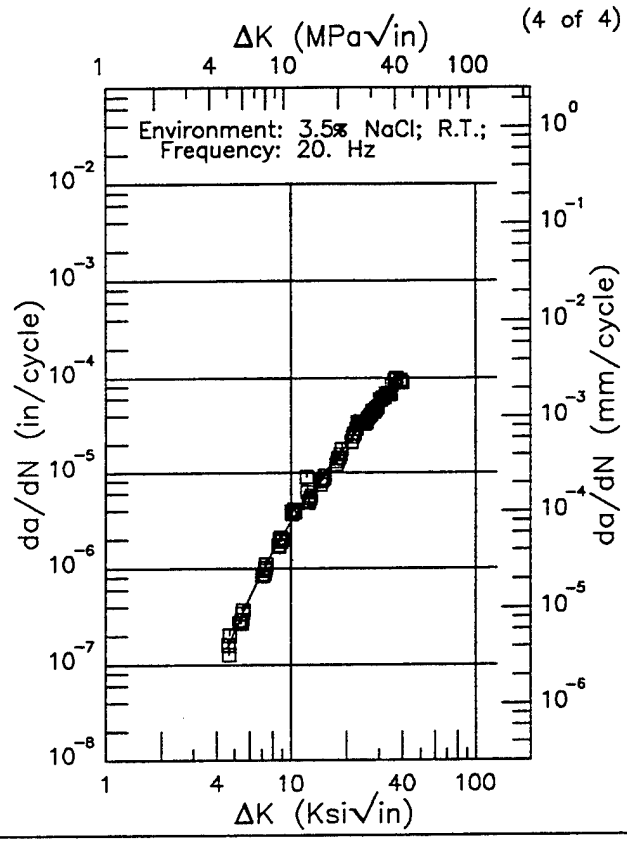
Figure 6.18.3.1.8

Ti–6Al–6V–2Sn EF

Condition/Ht: STOA
Form: 0.63 in. Plate
Specimen Type: CT
Orientation: L–T
Stress Ratio: 0.1

Yield Strength: 160 ksi
Ult. Strength: 170 ksi
Specimen Thk: 0.148 – 0.151 in.
Specimen Width: 3 in.
Ref: 86844





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.57 (min)	0.552
7.	0.660
8.	0.999
9.	1.49
10.	2.19
13.	6.04
16.	13.9
20.	33.8
25.	80.2
30.	164.
35.	305.
40.	528.
50.	2094.
54.97 (max)	13672.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.61 (min)	0.151
5.	0.223
6.	0.499
7.	0.916
8.	1.48
9.	2.19
10.	3.05
13.	6.46
16.	11.1
20.	19.5
25.	34.0
30.	53.7
35.	78.2
39.72 (max)	105.

RMS % Error	Life Prediction Ratio Summary
14.53	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
12.57	0. .5 .8 1.25 2.

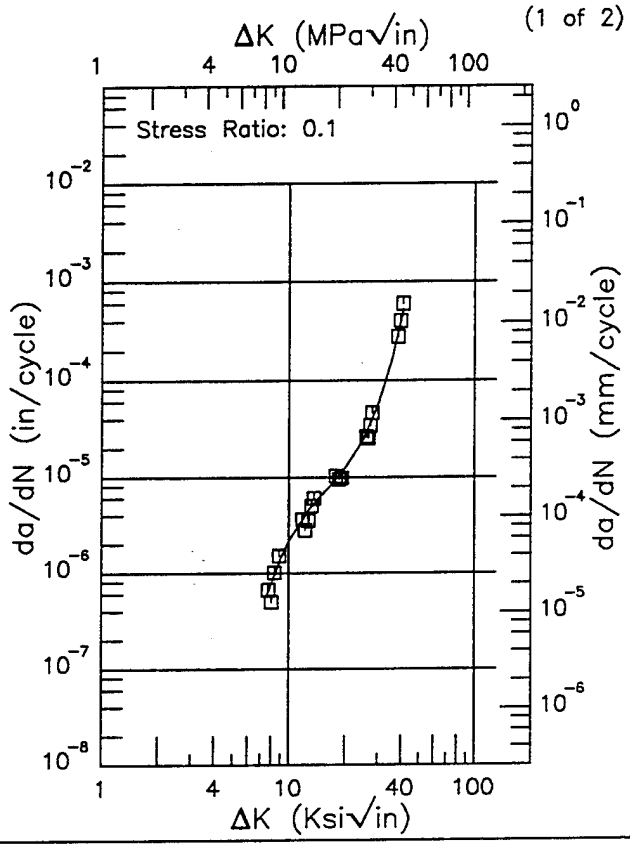
Figure 6.18.3.1.8 (Concluded)

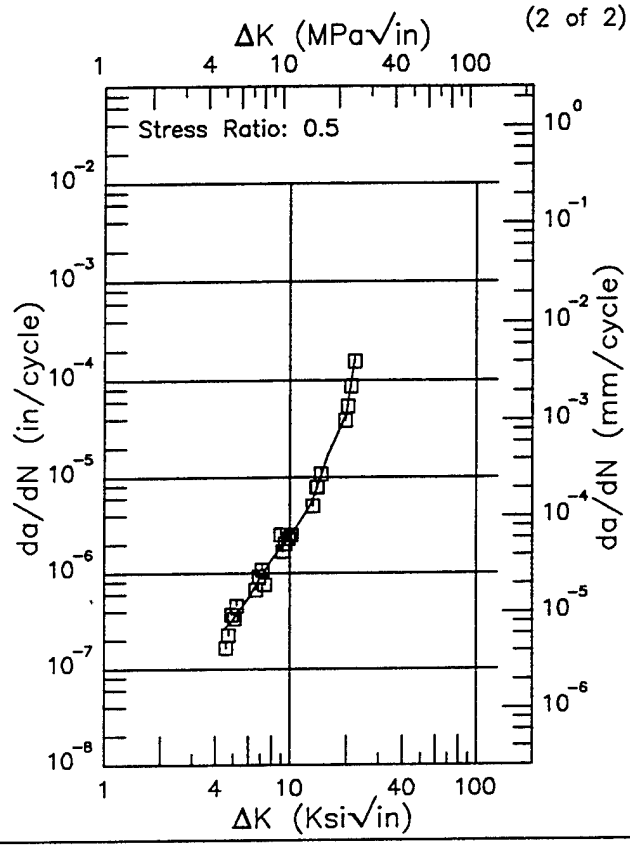
Ti–6Al–6V–2Sn

R

Condition/Ht: STOA
Form: 0.38 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Frequency: 10 Hz
Environment: H.H.A.; RT

Yield Strength: 160.3 ksi
Ult. Strength: 167.8 ksi
Specimen Thk: 0.375 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
7.71 (min)	0.615
8.	0.764
9.	1.40
10.	2.16
13.	4.71
16.	7.45
20.	12.4
25.	24.7
30.	56.3
35.	146.
40.	421.
41.04 (max)	531.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.54 (min)	0.271
5.	0.332
6.	0.550
7.	0.896
8.	1.35
9.	1.87
10.	2.37
13.	5.27
16.	16.9
20.	44.0
22.27 (max)	172.

RMS % Error	Life Prediction Ratio Summary
15.21	0. .5 .8 1.25 2.

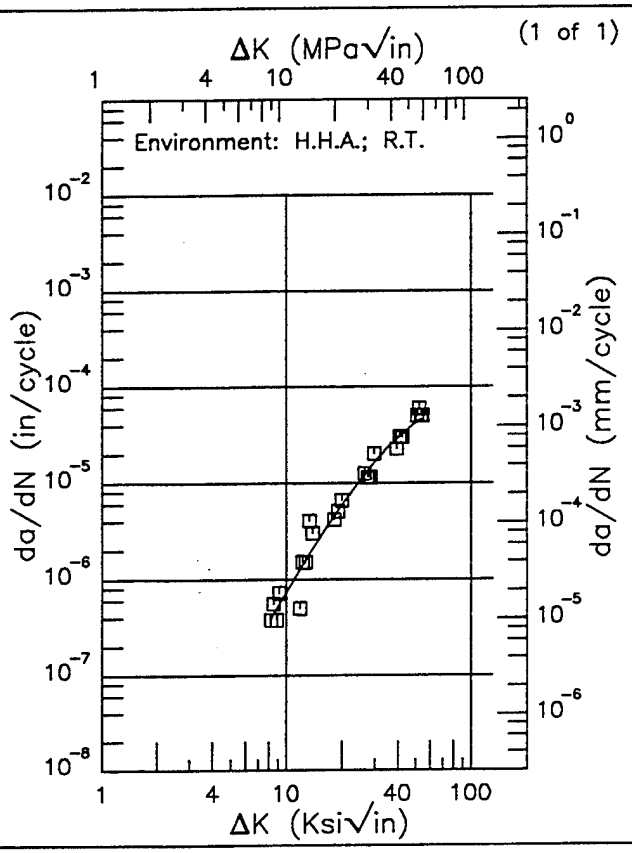
RMS % Error	Life Prediction Ratio Summary
16.67	0. .5 .8 1.25 2.

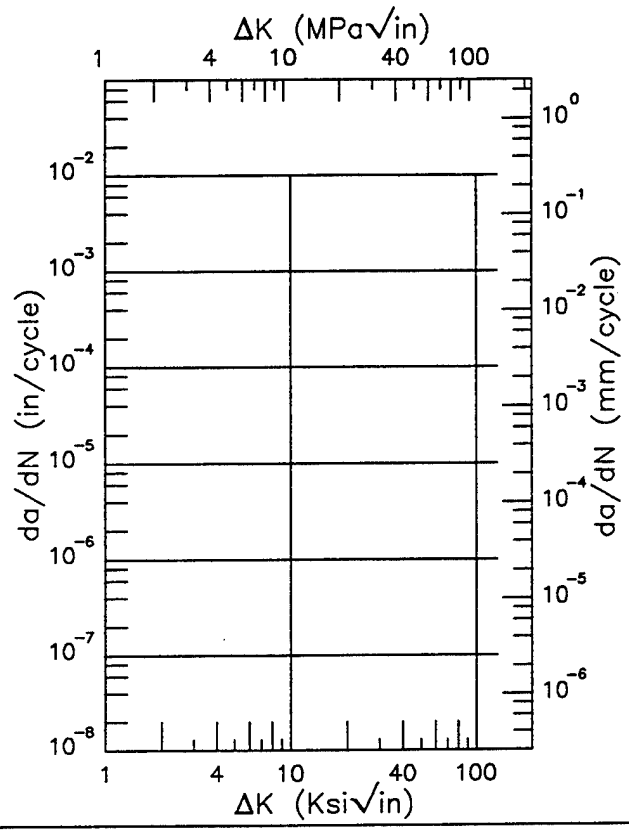
Figure 6.18.3.1.9

Ti–6Al–6V–2Sn E

Condition/Ht: STOA
Form: 0.13 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Frequency: 10 Hz

Yield Strength: 137.4 ksi
Ult. Strength: 143 ksi
Specimen Thk: 0.125 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.20 (min)	0.390
9.	0.525
10.	0.734
13.	1.67
16.	3.15
20.	5.98
25.	10.8
30.	16.7
35.	23.2
40.	29.9
50.	42.3
54.31 (max)	46.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error 34.05

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

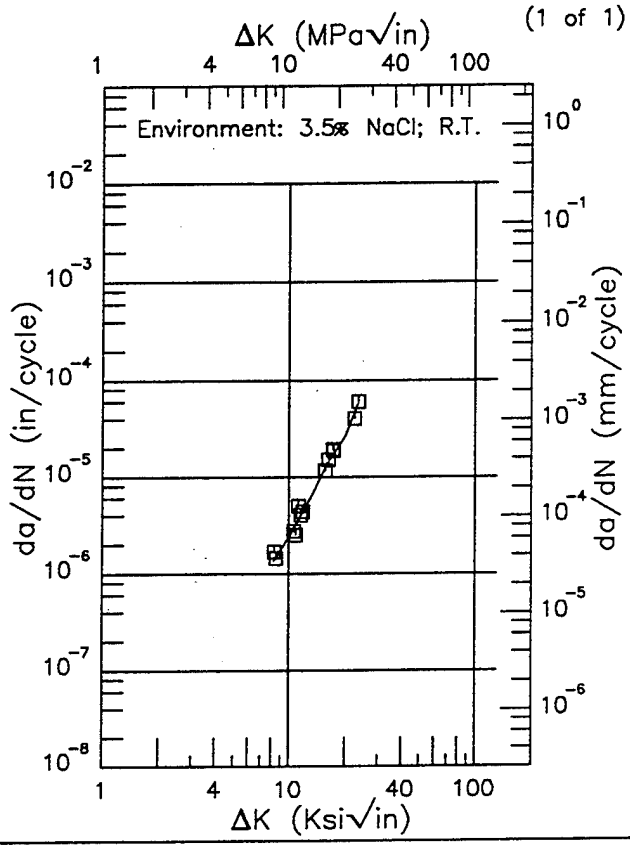
Figure 6.18.3.1.10

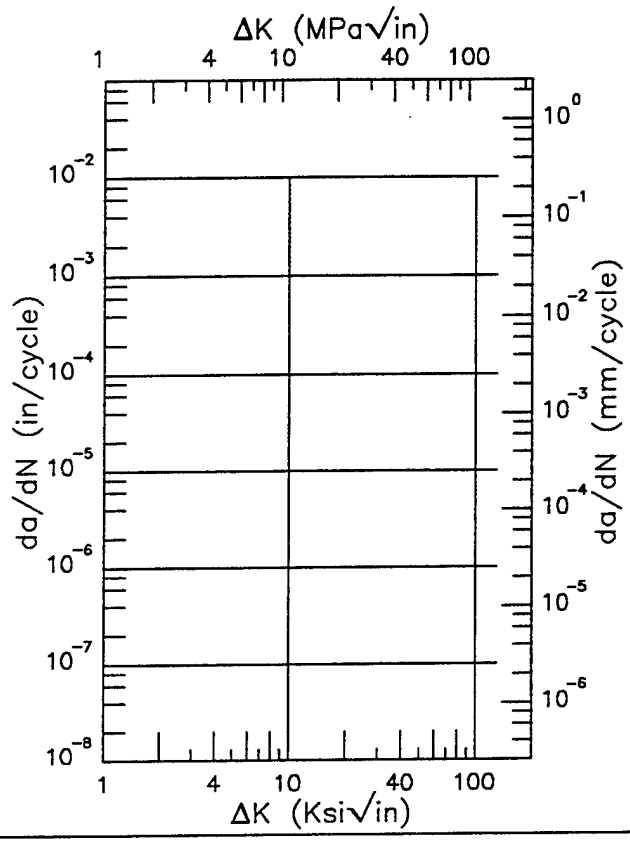
Ti–6Al–6V–2Sn

E

Condition/Ht: STOA
Form: 0.38 in. Plate
Specimen Type: CCP (max load specified)
Orientation: T–L
Stress Ratio: 0.1
Frequency: 0.1 Hz

Yield Strength: 160.3 ksi
Ult. Strength: 167.8 ksi
Specimen Thk: 0.375 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.30 (min)	1.37
9.	1.73
10.	2.38
13.	5.97
16.	13.7
20.	26.4
23.43 (max)	57.8

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
15.82	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.18.3.1.11

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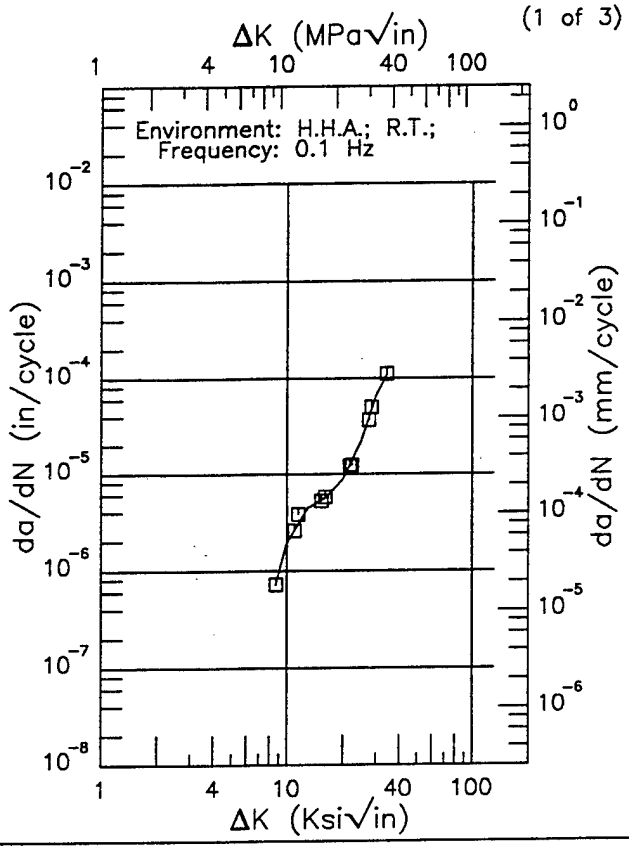
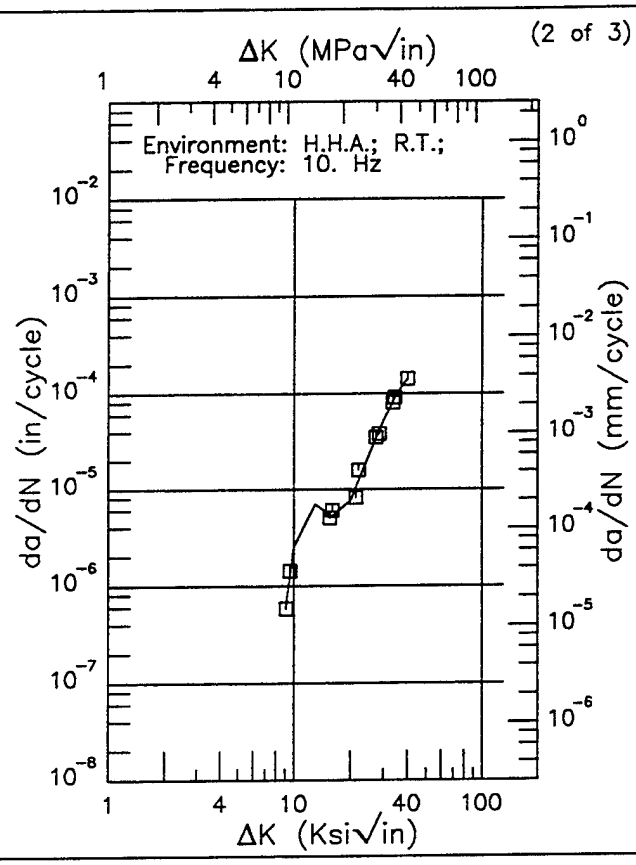
Ti–6Al–6V–2Sn

EF

Condition/Ht: STOA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: L–S
Stress Ratio: 0.1

Yield Strength: 130 ksi
Ult. Strength: 167.2 ksi
Specimen Thk: 0.372 – 0.374 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.70 (min)	0.708
9.	0.949
10.	1.94
13.	4.44
16.	5.64
20.	8.89
25.	22.6
30.	65.9
34.23 (max)	110.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.04 (min)	0.592
10.	2.53
13.	7.01
16.	5.18
20.	7.63
25.	22.0
30.	51.7
35.	96.5
39.96 (max)	140.

RMS % Error	Life Prediction Ratio Summary
9.58	0. .5 .8 1.25 2.

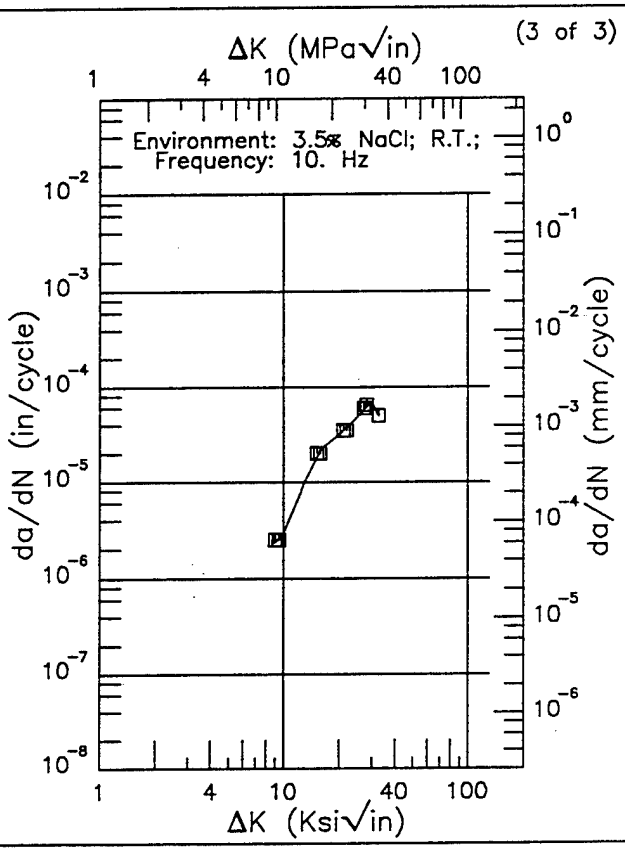
RMS % Error	Life Prediction Ratio Summary
12.37	0. .5 .8 1.25 2.

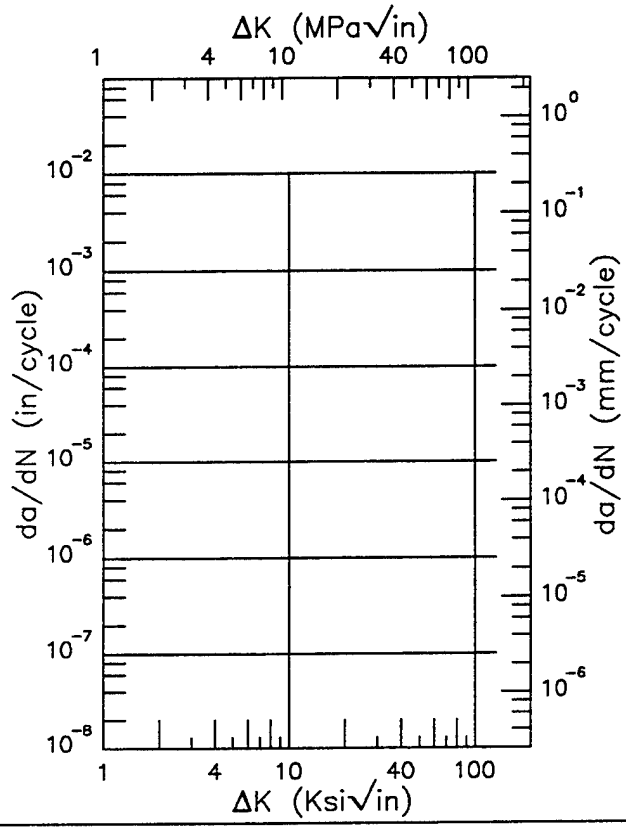
Figure 6.18.3.1.12

Ti–6Al–6V–2Sn EF

Condition/Ht: STOA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: L–S
Stress Ratio: 0.1

Yield Strength: 130 ksi
Ult. Strength: 167.2 ksi
Specimen Thk: 0.372 – 0.374 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.98 (min)	2.38
9.	2.38
10.	2.92
13.	10.0
16.	22.6
20.	31.7
25.	48.6
30.	69.8
32.63 (max)	50.0

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 5.87

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

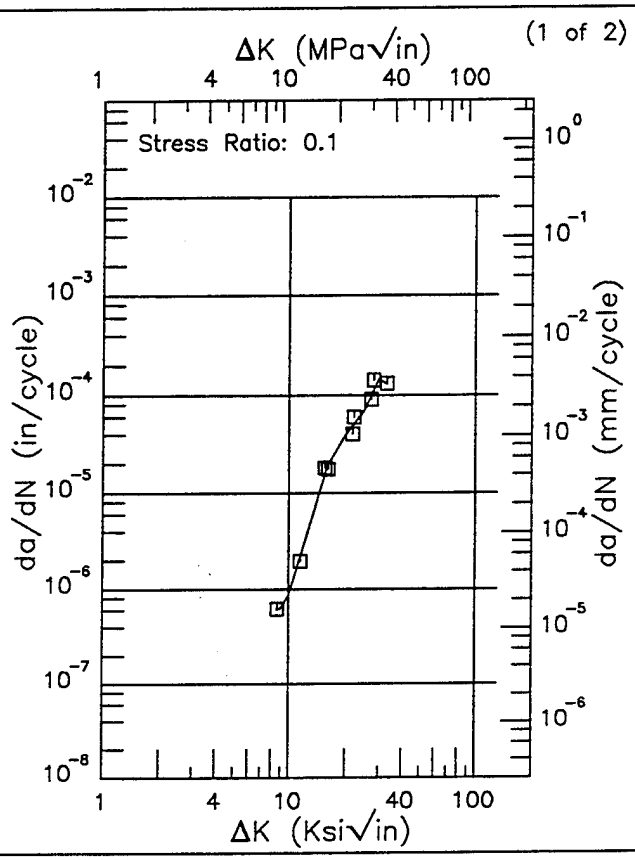
Figure 6.18.3.1.12 (Concluded)

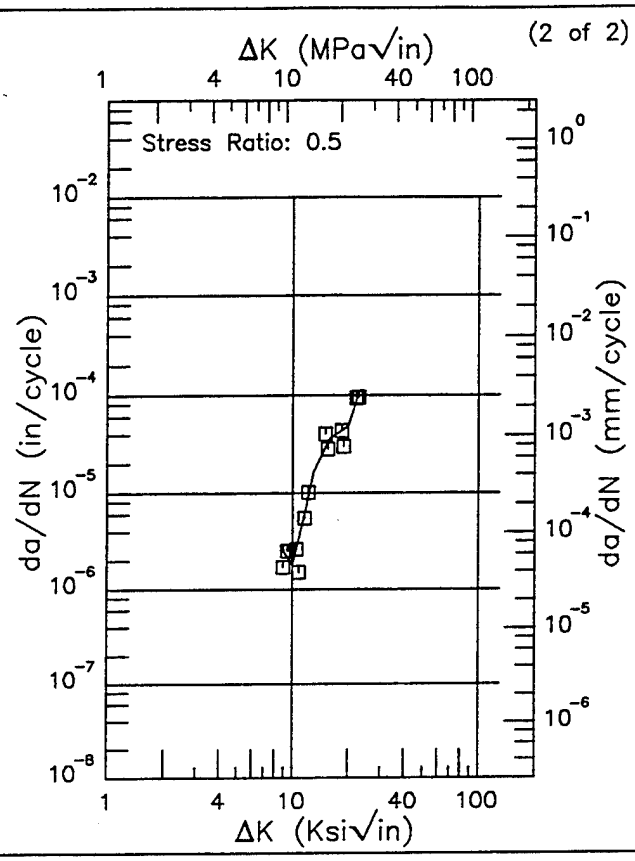
Ti–6Al–6V–2Sn

R

Condition/Ht: STOA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: T–S
Frequency: 0.1 Hz
Environment: H.H.A.; RT

Yield Strength: 130 ksi
Ult. Strength: 167.2 ksi
Specimen Thk: 0.373 – 0.374 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.60 (min)	0.608
9.	0.630
10.	0.875
13.	4.81
16.	19.4
20.	39.8
25.	70.4
30.	148.
33.13 (max)	131.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
8.90 (min)	2.79
9.	2.47
10.	1.83
13.	16.6
16.	36.5
20.	48.8
22.70 (max)	102.

RMS % Error	Life Prediction Ratio Summary
14.14	0. .5 .8 1.25 2.

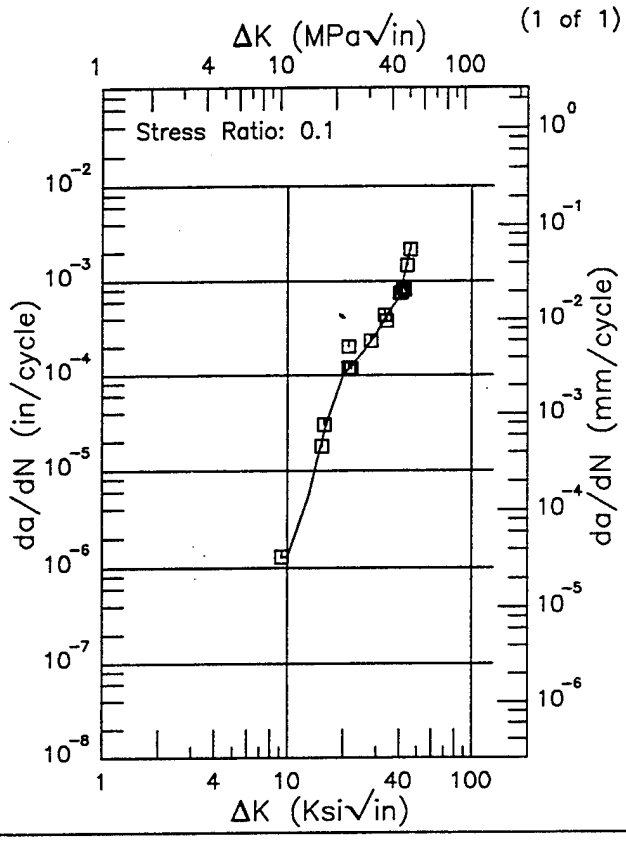
RMS % Error	Life Prediction Ratio Summary
26.12	0. .5 .8 1.25 2.

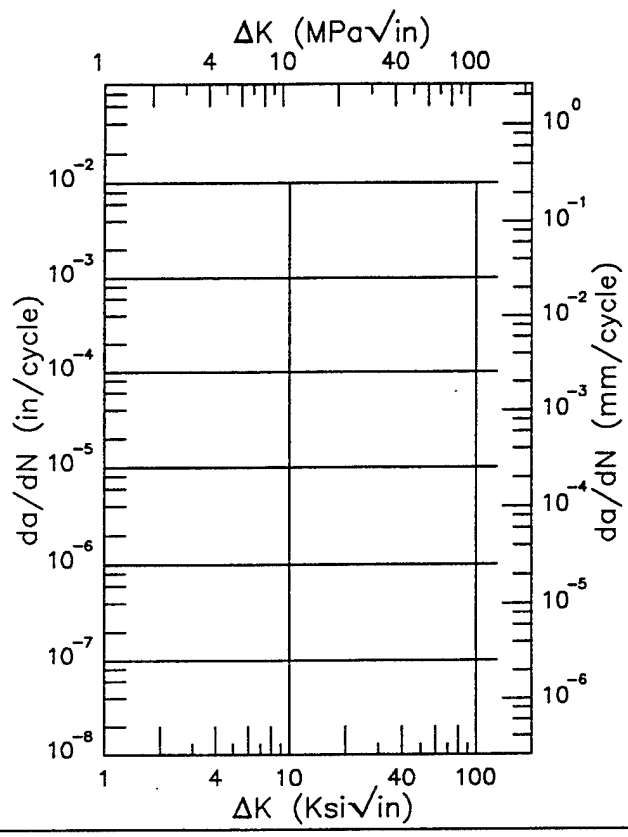
Figure 6.18.3.1.13

Ti–6Al–6V–2Sn R

Condition/Ht: STOA
Form: 0.38 in. Plate
Specimen Type: PTSF (max stress specified)
Orientation: T–S
Frequency: 1 Hz
Environment: 3.5% NACL; RT

Yield Strength: 156.5 ksi
Ult. Strength: 167.8 ksi
Specimen Thk: 0.375 in.
Specimen Width: 5 in.
Ref: 90981





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.26 (min)	1.28
10.	1.30
13.	5.25
16.	28.1
20.	100.
25.	168.
30.	275.
35.	470.
40.	674.
45.85 (max)	2109.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
22.11	0. .5 .8 1.25 2.

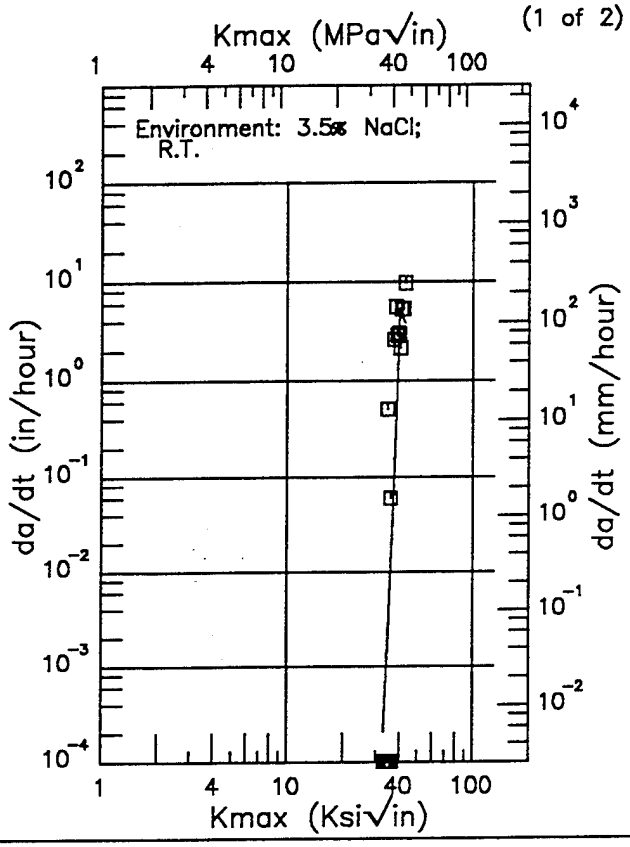
RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

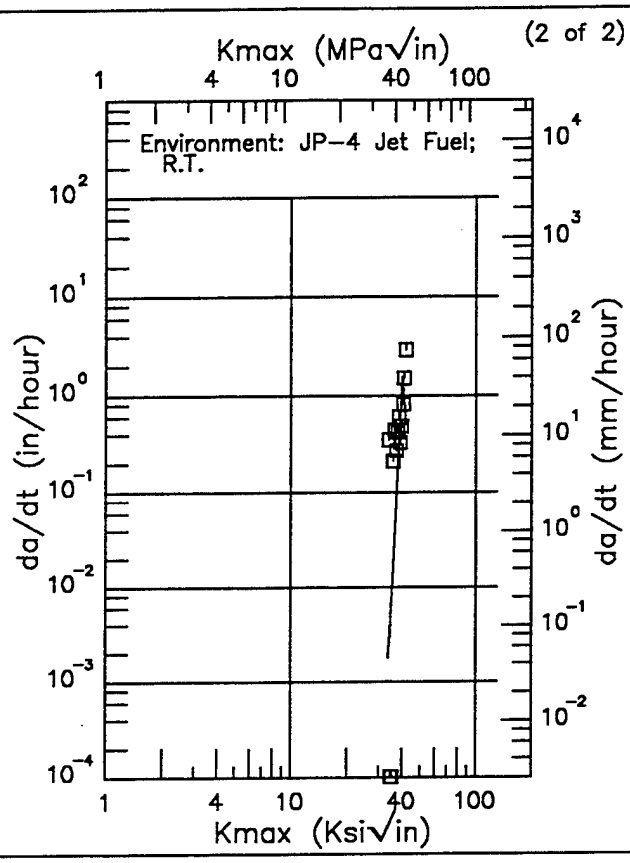
Figure 6.18.3.1.14

Ti–6Al–6V–2Sn

Condition/Ht: 1300F 2HR
Form: 2 in. Forging
Specimen Type: TDCB
Orientation: L–T
Yield Strength: 146 ksi
Ult. Strength:

Specimen Thk: 1.25 in.
Specimen Width: 5.5 in.
A_o:
K_{Iscc}: 31 – 32 ksi
Ref: 84360





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
33.10 (min)	0.210
35.	3.68
40.	5322.
42.70 (max)	3848.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
33.70 (min)	1.79
35.	6.54
40.	1553.
41.50 (max)	631.

RMS % Error	
>100.0	

RMS % Error	
>100.0	

Figure 6.18.3.2

TABLE 6.19.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-6Al-6V-2.5Sn

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Reference
						Design	Width (in)	Thick (in)							
Unspecified	P	R.T.	---	186	3.5% NaCl	CANT	---	---	---	---	55	21	---	1967	70887
1000°F 2hr AC	F	R.T.	L-T	155.1	JP-4 Fuel	TDCB	5	1.25	2.2	---	57.1	30.5	---	1971	84360
1300°F 2hr AC	F	R.T.	L-T	146.2	3.5% NaCl	TDCB	5	1.25	2.2	---	47.3	32.4	---	1971	84360
1550°F 1hr WQ 900°F 4hr AC	P	R.T.	T-S	179.6	3.5% NaCl	CANT*	1	0.75	1	---	55	21	---	1967	70931

* asterisk in specimen design column indicates that specimens are side-grooved

TABLE 6.20.2.1

TITANIUM Ti-6Al-2Sn-4Zr-6Mo K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * (K_{Ic}/TYS)^2 (in.)	K_{Ic} (K_{Ic} (Ksi√in.)	K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
50% PRIMARY ALPHA	Forging	2.00	R.T.	---	153.0	---	2.000	---	---	0.21	43.96	---	---	---	RI005
BETA PROCESSED	Forging	2.00	R.T.	---	156.6	---	2.000	---	---	0.52	71.44	---	---	---	RI005
BU B FIN-10MA BETA UPSET BETA FINISHED 10% PRIMARY ALPHA MILL ANNEALED 1300 F 1 HR AC	Forging	2.75	R.T.	---	148.0	2.000	1.000	CT	1.000	0.09	28.50	27.9	1.0	1974	88962 (1)
		2.75			148.0	2.000	1.000	CT	1.000	0.08	26.70			1974	88962 (1)
		2.75			148.0	2.000	1.000	CT	1.000	0.09	28.50			1974	88962 (1)
BU B FIN-10STA BETA UPSET BETA FINISHED 10% PRIMARY ALPHA SOLUTION TREATED	Forging	2.75	R.T.	---	162.0	2.000	1.000	CT	1.000	0.10	31.30	31.1	0.6	1974	88962 (1)
		2.75			162.0	2.000	1.000	CT	1.000	0.09	30.40			1974	88962 (1)
		2.75			162.0	2.000	1.000	CT	1.000	0.10	31.60			1974	88962 (1)
BU B FIN-10STO BETA UPSET BETA FINISHED 10% PRIMARY ALPHA SOLUTION TREATED & OVERAGED 1625F 1 HR AC 1300F 1 HR AC	Forging	2.75	R.T.	---	148.0	2.000	1.000	CT	1.000	0.08	27.10	28.4	1.8	1974	88962 (1)
		2.75			148.0	2.000	1.000	CT	1.000	0.10	29.70			1974	88962 (1)
BU B FIN-50MA BETA UPSET BETA FINISHED 50% PRIMARY ALPHA MILL ANNEALED 1300F 1 HR AC	Forging	2.75	R.T.	---	154.0	2.000	1.000	CT	1.000	0.05	22.70	23.8	1.6	1974	88962 (1)
		2.75			154.0	2.000	1.000	CT	1.000	0.06	24.90			1974	88962 (1)
BU B FIN-50STA BETA UPSET BETA FINISHED 50% PRIMARY ALPHA SOLUTION TREATED & AGED 1625F 1 HR AC 1100F 8 HR AC	Forging	2.75	R.T.	---	167.0	2.000	1.000	CT	1.000	0.05	24.00	24.4	0.6	1974	88962 (1)
		2.75			167.0	2.000	1.000	CT	1.000	0.05	24.80			1974	88962 (1)

NOTES: (1) COMP. DISK

TABLE 6.20.2.1 (CONCLUDED)

TITANIUM Ti-6Al-2Sn-4Zr-6Mo K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
BU HABFIN10STA BETA UPSET HI ALPHA-BETA FINISHED 10% REDUCTION SOLUTION	Forging	2.75	R.T.	---	159.0	2.000	1.000	CT	1.000	0.16	40.50	41.4	0.9	1974	88962 (1)
		2.75			159.0	2.000	1.000	CT	1.000	0.18	42.30			1974	88962 (1)
		2.75			159.0	2.000	1.000	CT	1.000	0.17	41.50			1974	88962 (1)
BU HABFIN30STA BETA UPSET HI ALPHA-BETA FINISHED 30% REDUCTION SOLUTION TREATED	Forging	2.75	R.T.	---	161.0	2.000	1.000	CT	1.000	0.13	36.40	37.4	1.3	1974	88962 (1)
		2.75			161.0	2.000	1.000	CT	1.000	0.15	38.90			1974	88962 (1)
		2.75			161.0	2.000	1.000	CT	1.000	0.13	36.90			1974	88962 (1)
BU LABFIN10STA BETA UPSET LO ALPHA-BETA FINISHED 10% REDUCTION SOLUTION TREATED	Forging	2.75	R.T.	---	155.0	2.000	1.000	CT	1.000	0.21	44.80	44.7	1.1	1974	88962 (1)
		2.75			155.0	2.000	1.000	CT	1.000	0.20	43.60			1974	88962 (1)
		2.75			155.0	2.000	1.000	CT	1.000	0.22	45.80			1974	88962 (1)
STA-1625F 2 HR AC 1100F 8 HR AC	Forging	---	R.T.	---	163.0	2.000	1.000	CT	1.000	0.10	32.40	31.2	1.3	1974	88962 (2)
		---			163.0	2.000	1.000	CT	1.000	0.10	32.70			1974	88962 (2)
		---			163.0	2.000	1.000	CT	1.000	0.09	31.60			1974	88962 (2)
		---			166.0	2.000	1.000	CT	1.000	0.08	29.20			1974	88962 (3)
		---			166.0	2.000	1.000	CT	1.000	0.08	30.20			1974	88962 (3)
		---			166.0	2.000	1.000	CT	1.000	0.09	31.20			1974	88962 (3)

NOTES: (1) COMP. DISK
(2) COMP. DISK COARSE GRAIN SIZE
(3) COMP. DISK FINE GRAIN SIZE

TABLE 6.21.1.2.1

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK Ti-8Al-1Mo-1V AT ROOM TEMPERATURE

ORIENTATION: L-T **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	FCGR (10^{-6} in/cycle) ΔK Level (Ksi√in)					
				2.5	6.0	10.0	20.0	50.0	100.0
1825F 1HR AC 1350F 2HRS AC	UNSPECIFIED	0.	0.33				10.22		
		0.04	0.33			0.51			
DA	SHEET	0.1	43				7.92	238.6	
		0.25	1-30					160.57	
		0.67	1-30			2.54			
MA	SHEET	0.1	43				7.3		
UNSPECIFIED	SHEET	0.02	0.1-12			2.28	13.54	144.35	

TABLE 6.21.1.2.2

FATIGUE CRACK GROWTH RATE AT DEFINED LEVELS OF STRESS INTENSITY FACTOR ΔK
Ti-8Al-1Mo-1V AT ROOM TEMPERATURE

ORIENTATION: C-R **ENVIRONMENT: Lab Air**

CONDITION/ HEAT TREATMENT	PRODUCT FORM	R	FREQ (Hz)	*FCGR* (10^{-6} *in/cycle*)					
				ΔK *Level* (*Ksi*$\sqrt{in}$)					
				2.5	5.0	10.0	20.0	50.0	100.0
1830F 1HR WQ 1100F 8HRS AC	FORGING	0.1	30		0.13	1.14			

TABLE 6.21.2.1

TITANIUM Ti-8Al-1Mo-1V K_{Ic}																
CONDITION	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN			CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic}			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	DESIGN			K_{Ic} (Ksi√in.)	K_{Ic} MEAN	STAN DEV		
1830F 1 HR WQ 1100F 8 HRS AC	Forging	---	R.T.	C-R	142.0	2.500	0.500	---	---	0.18	38.22	---	---	1977	PW002

TABLE 6.21.2.2

TI-8AL-1MO-1V K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{max}	K_{app} K_{app} (Ksi√in.)	K_{app} K_{app} MEAN	K_{app} STAN DEV	K_C K_C (Ksi√in.)	K_C K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
DA	Sheet	0.05	R.T.	L-T	133.6	8.000	0.050	1.020	2.100	75.20	105.00	134.26*	136.3	13.2	199.24*	---	---	1968	71709
		0.05			133.6	8.000	0.050	1.990	3.390	52.90	79.20	145.62			206.08*			1968	71709
		0.05			133.6	8.000	0.050	5.010	5.700	19.00	33.70	127.02			152.64*			1968	71709
		0.05			133.6	8.000	0.050	3.500	4.790	27.00	79.90	213.08*			285.48*			1968	71709
		0.05			133.6	8.000	0.050	1.500	3.050	62.00	87.50	137.30*			210.73*			1968	71709
DA	Sheet	0.02	R.T.	L-T	135.5	9.000	0.020	2.110	2.630	62.20	73.30	138.16	---	---	157.35	---	---	1966	67821
DA	Sheet	0.04	R.T.	L-T	132.6	9.000	0.045	2.100	2.970	45.90	66.10	124.25	---	---	153.19	---	---	1966	67821
DA	Sheet	0.02	R.T.	L-T	135.5	12.000	0.020	2.020	2.360	41.60	47.90	86.85	98.4	10.0	94.49	111.7	15.0	1966	67821
		0.02			135.5	12.000	0.020	0.950	1.240	75.00	85.00	104.24			119.42			1966	67821
		0.02			135.5	12.000	0.020	0.580	0.700	95.00	110.20	105.34*			115.80*			1966	67821
		0.02			135.5	12.000	0.020	2.120	2.800	42.50	55.90	104.02			121.33			1966	67821
DA	Sheet	0.05	R.T.	L-T	133.6	20.000	0.050	2.060	5.000	62.40	85.90	155.54	158.1	11.8	250.46*	220.5	15.8	1968	71709
		0.05			133.6	20.000	0.050	2.020	4.000	29.10	77.40	138.75			198.94			1968	71709
		0.05			133.6	20.000	0.050	8.020	14.500	26.50	42.70	168.60			314.95*			1968	71709
		0.05			133.6	20.000	0.050	9.940	15.000	22.80	36.40	170.65			285.62*			1968	71709

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

TABLE 6.21.2.2 (CONCLUDED)

TI-8AL-1MO-1V K_C

CONDITION HEAT TREAT	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	CRACK LENGTH INIT (in.) $2a_o$	CRACK LENGTH FINAL (in.) $2a_f$	GROSS STRESS ONSET (Ksi) σ_o	GROSS STRESS MAX (Ksi) σ_{Max}	K_{app} K_{app} (Ksi√in.)	K_{app} K_{app} MEAN	K_{app} STAN DEV	K_C K_C (Ksi√in.)	K_C K_C MEAN	K_C STAN DEV	DATE	REFER
BUCKLING OF CRACK EDGES RESTRAINED																			
DA Cont'd	Sheet Cont'd	0.05	R.T. Cont'd	L-T Cont'd	133.6	20.000	0.050	6.040	10.000	26.80	47.60	155.45	Cont'd	Cont'd	224.35	Cont'd	Cont'd	1968	71709
		0.05			133.6	20.000	0.050	9.980	15.600	19.30	30.50	143.50			259.41*			1968	71709
		0.05			133.6	20.000	0.050	6.800	11.080	36.40	45.60	160.64			236.94			1968	71709
		0.05			133.6	20.000	0.050	4.260	7.500	36.90	58.90	156.77			221.71			1968	71709
		0.05			133.6	20.000	0.050	3.760	7.520	48.60	69.80	173.43			263.23*			1968	71709
DA	Sheet	0.05	R.T.	T-L	135.3	8.000	0.050	4.910	5.700	26.90	37.80	139.02	144.4	4.9	171.22*	---	---	1968	71709
		0.05			135.3	8.000	0.050	1.000	2.250	65.00	105.00	132.88*			207.62*			1968	71709
		0.05			135.3	8.000	0.050	2.940	4.250	39.40	62.00	145.55			195.48*			1968	71709
		0.05			135.3	8.000	0.050	2.020	3.650	42.90	80.10	148.56			220.88*			1968	71709
		0.05			135.3	8.000	0.050	1.520	3.100	51.70	91.80	145.09*			223.65*			1968	71709

* NOTE: NET SECTION STRESS EXCEEDS 80% OF YIELD STRENGTH. VALUE NOT INCLUDED IN MEAN OR STANDARD DEVIATION.

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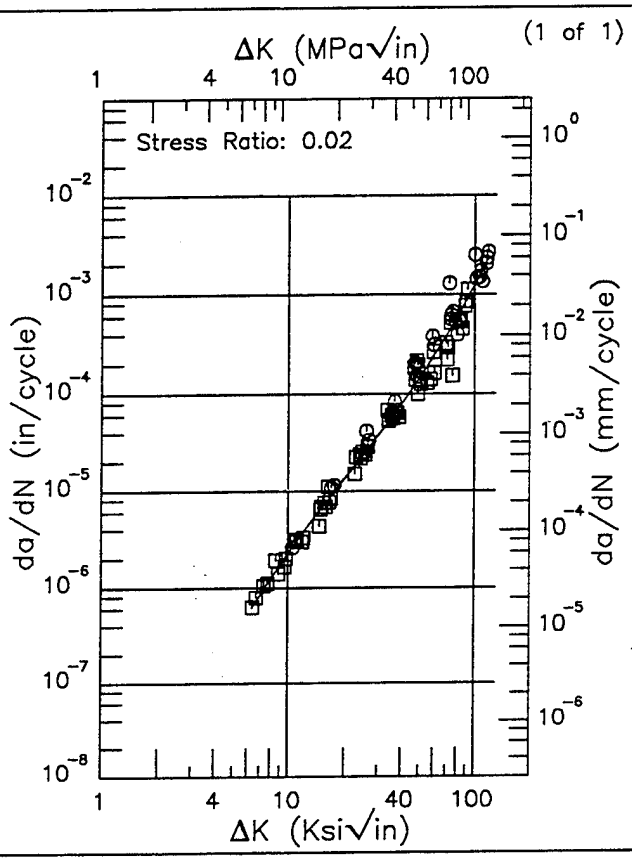
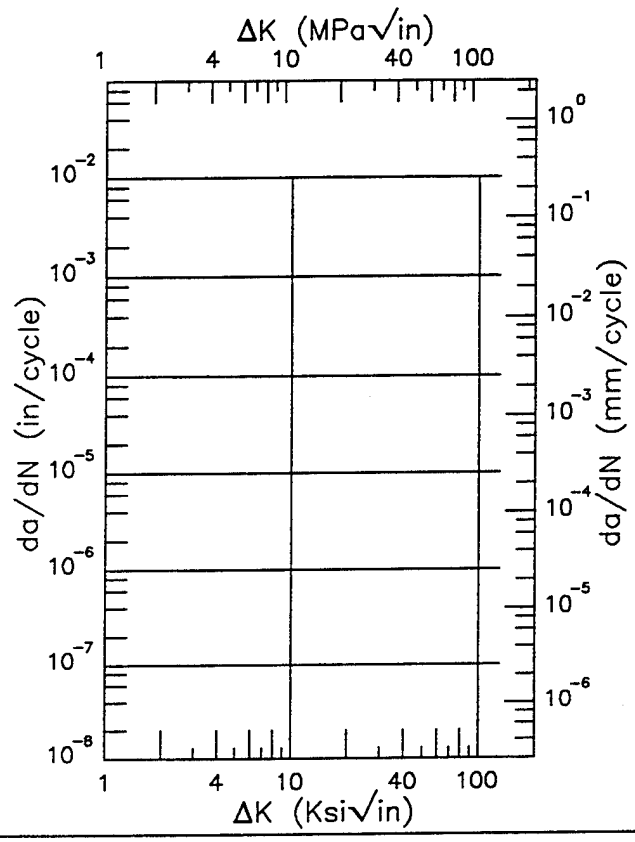
Ti–8Al–1Mo–1V

R

Condition/Ht:
Form: 0.05 in. Sheet
Specimen Type: CCP (max stress specified)
Orientation: L–T
Frequency: 0.1 – 12 Hz
Environment: LAB AIR; RT

Yield Strength: 119.5 ksi
Ult. Strength: 134 ksi
Specimen Thk: 0.05 in.
Specimen Width: 6 in.
Ref: MA011





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.38 (min)	0.621
7.	0.824
8.	1.22
9.	1.70
10.	2.28
16.	7.75
20.	13.5
30.	37.3
40.	78.7
60.	243.
80.	589.
100.	1243.
118.36 (max)	2281.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
34.74	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.21.3.1.1

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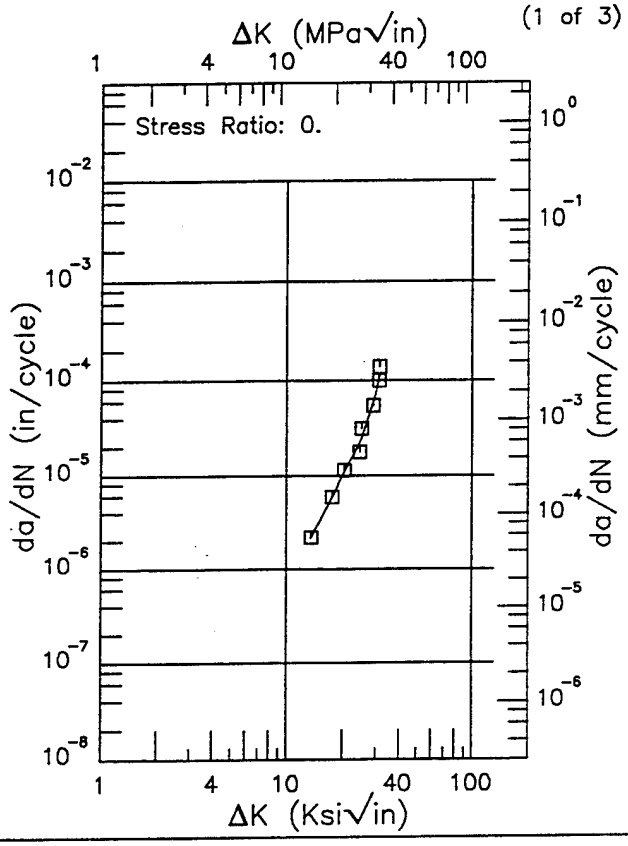
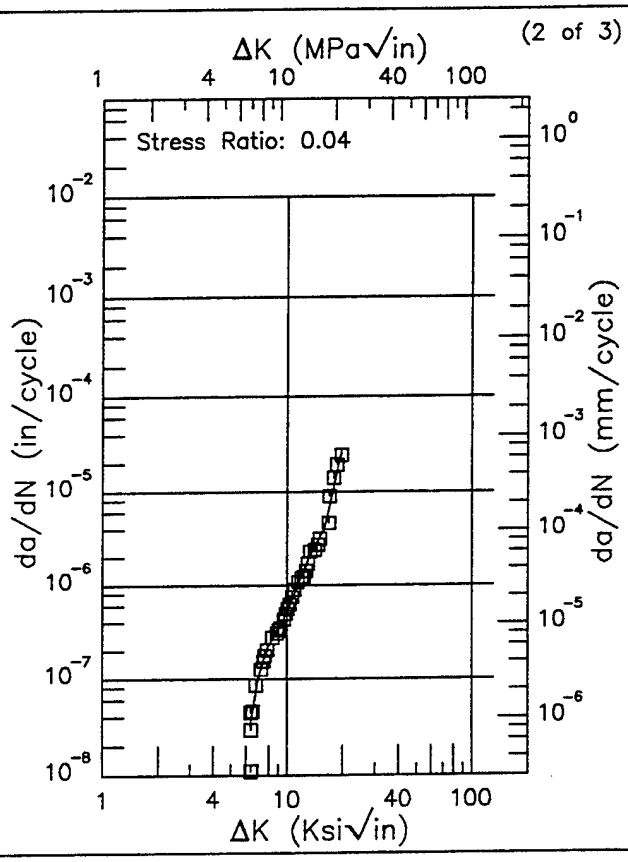
R

Ti–8Al–1Mo–1V

Condition/Ht: 1825F 1HR AC 1350F 2HRS AC
Form:
Specimen Type: KB Bar
Orientation: L–T
Frequency: 0.3 Hz
Environment: LAB AIR; RT

Yield Strength: 120 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.253 in.
Specimen Width: 0.75 in.
Ref: GE006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
13.50 (min)	2.15
16.	4.13
20.	10.2
25.	23.8
30.	74.2
31.31 (max)	114.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
6.37 (min)	0.0326
7.	0.0996
8.	0.229
9.	0.341
10.	0.508
13.	1.86
16.	4.10
19.64 (max)	25.1

RMS % Error	Life Prediction Ratio Summary
14.89	0. .5 .8 1.25 2.

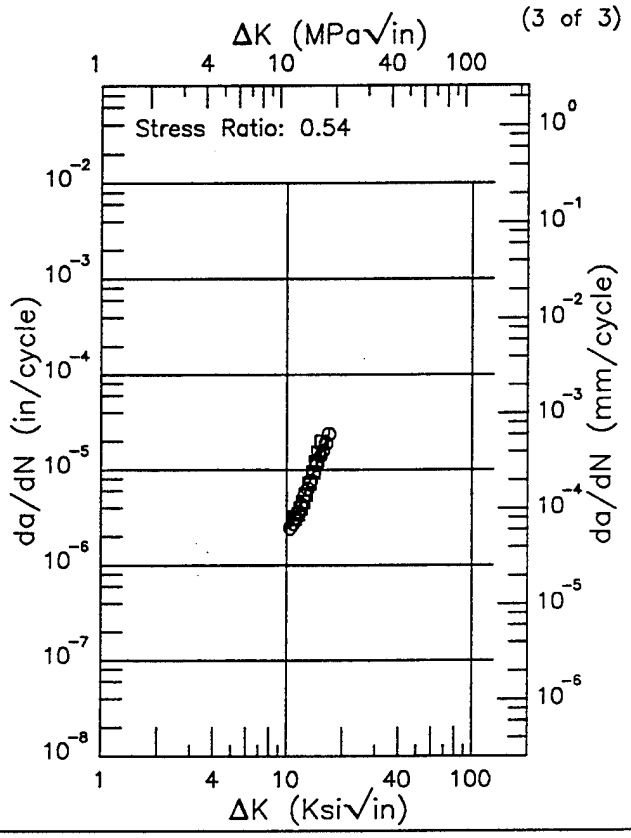
RMS % Error	Life Prediction Ratio Summary
18.30	0. .5 .8 1.25 2.

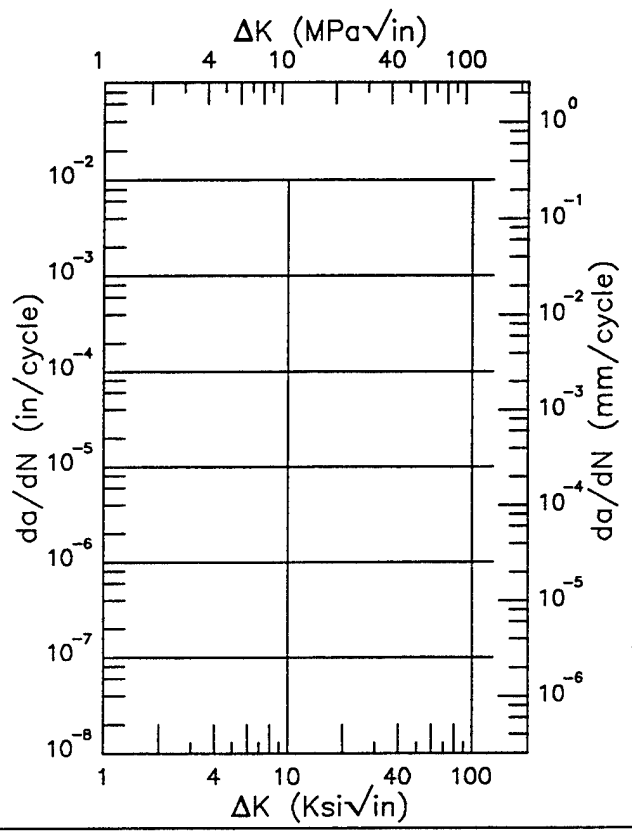
Figure 6.21.3.1.2

Ti–8Al–1Mo–1V R

Condition/Ht: 1825F 1HR AC 1350F 2HRS AC
Form:
Specimen Type: KB Bar
Orientation: L–T
Frequency: 0.3 Hz
Environment: LAB AIR; RT

Yield Strength: 120 ksi
Ult. Strength:
Specimen Thk: 0.251 – 0.253 in.
Specimen Width: 0.75 in.
Ref: GE006





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
10.39 (min)	2.48
13.	6.62
16.	19.0
16.74 (max)	21.9

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary
8.96	0. .5 .8 1.25 2.

RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.

Figure 6.21.3.1.2 (Concluded)

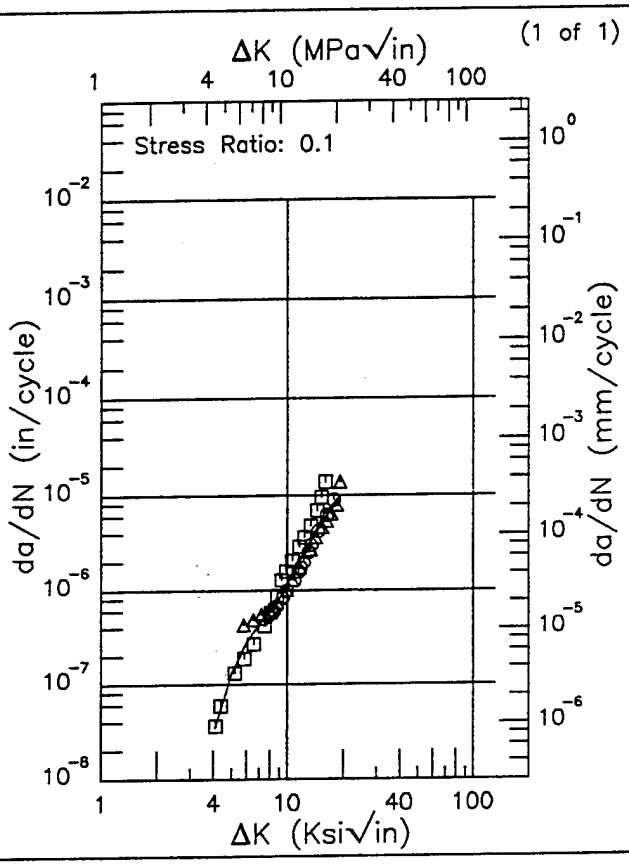
R

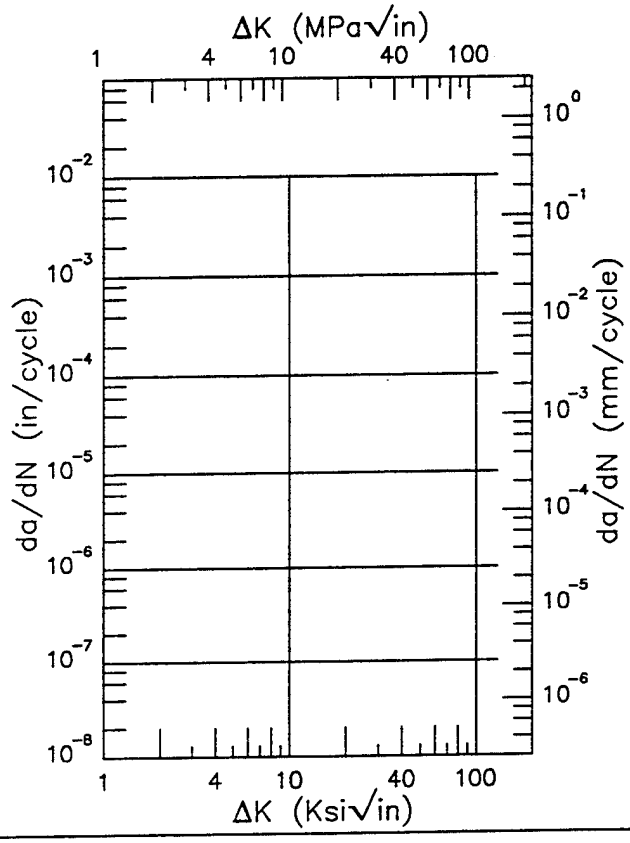
Ti–8Al–1Mo–1V

Condition/Ht: 1830F 1HR WQ 1100F 8HRS AC
Form: 1 in. Forging
Specimen Type: CCP (max load specified)
Orientation: C–R
Frequency: 30 Hz
Environment: LAB AIR; RT

Yield Strength: 135.5 – 145.8 ksi
Ult. Strength: 148.5 – 159.3 ksi
Specimen Thk: 0.078 – 0.08 in.
Specimen Width: 1.75 in.
Ref: PW002

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
4.09 (min)	0.0347
5.	0.130
6.	0.277
7.	0.433
8.	0.604
9.	0.824
10.	1.14
13.	3.04
16.	6.83
19.11 (max)	9.55

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 31.78

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.21.3.1.3

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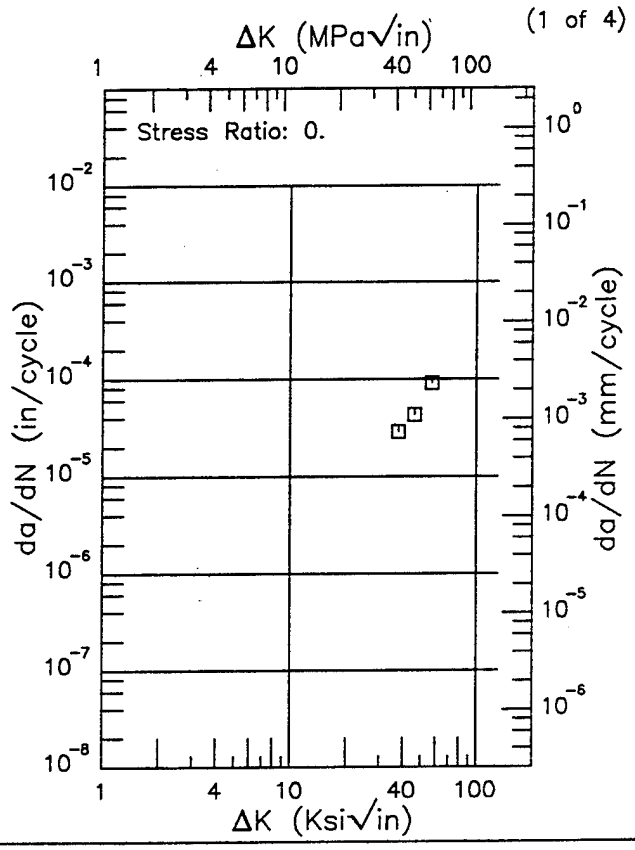
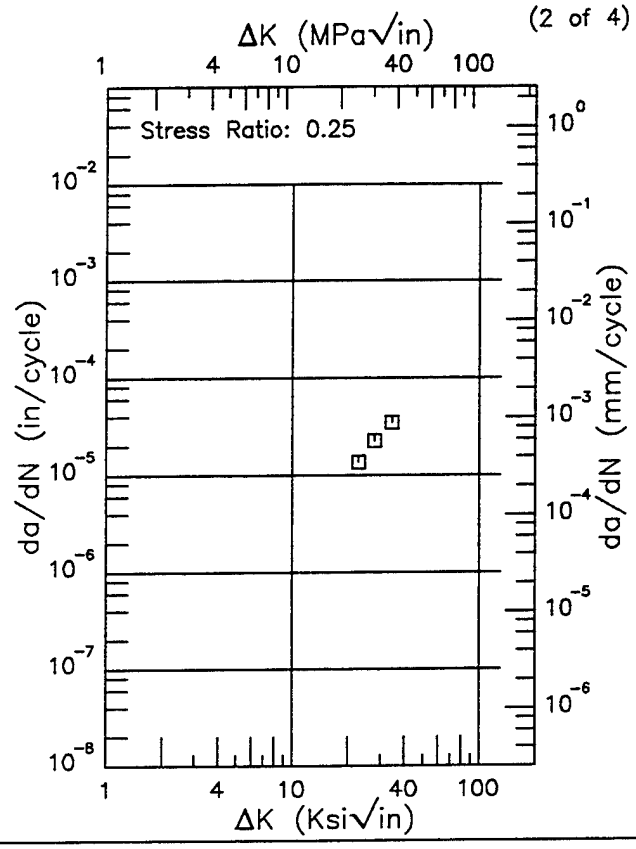
R

Ti–8Al–1Mo–1V

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 2 in.
Ref: 86099





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

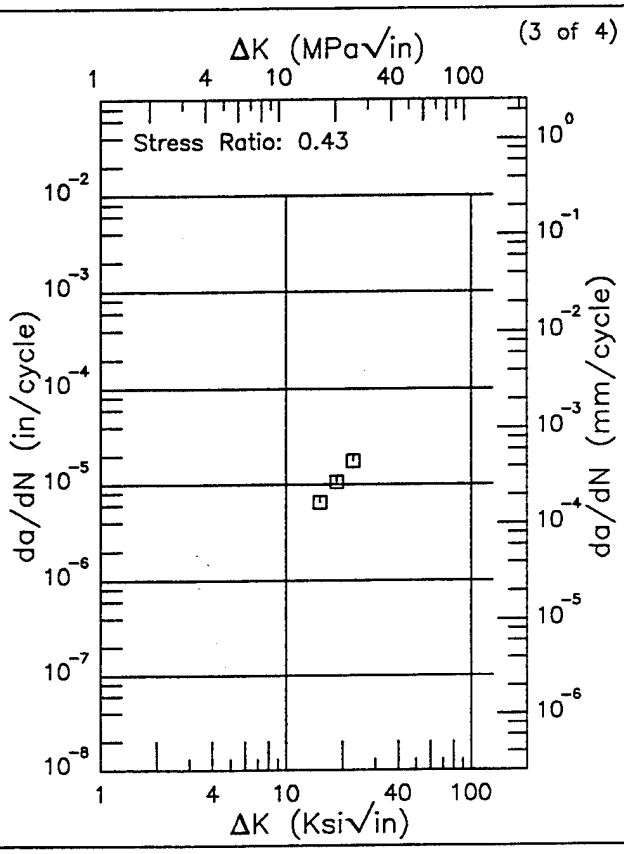
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

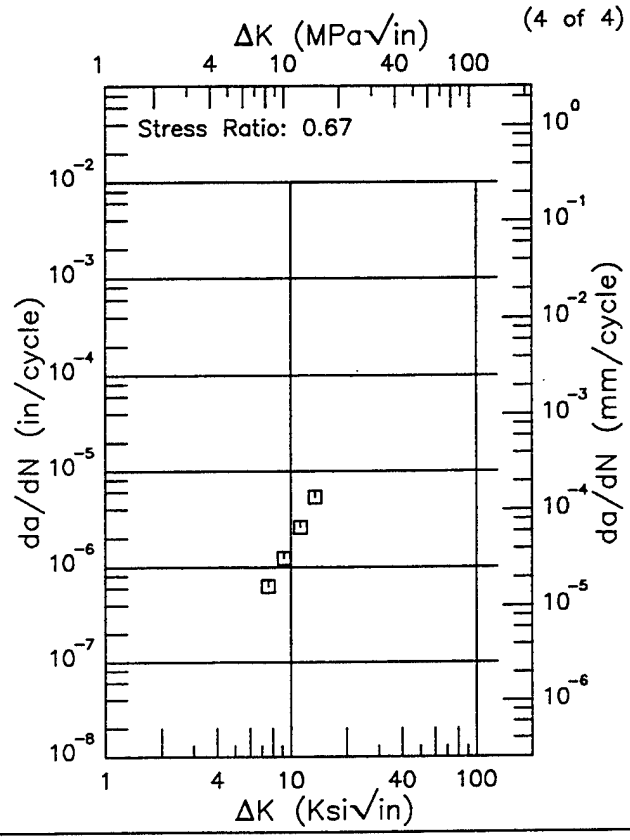
Figure 6.21.3.1.4

Ti–8Al–1Mo–1V R

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 2 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
RMS % Error	Life Prediction Ratio Summary 0. .5 .8 1.25 2.	RMS % Error	Life Prediction Ratio Summary 0. .5 .8 1.25 2.

Figure 6.21.3.1.4 (Concluded)

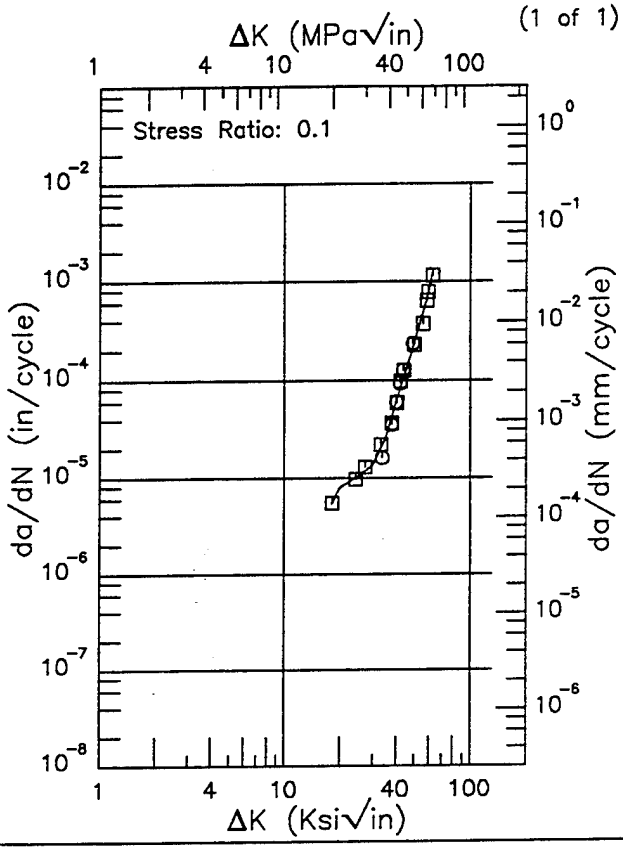
R

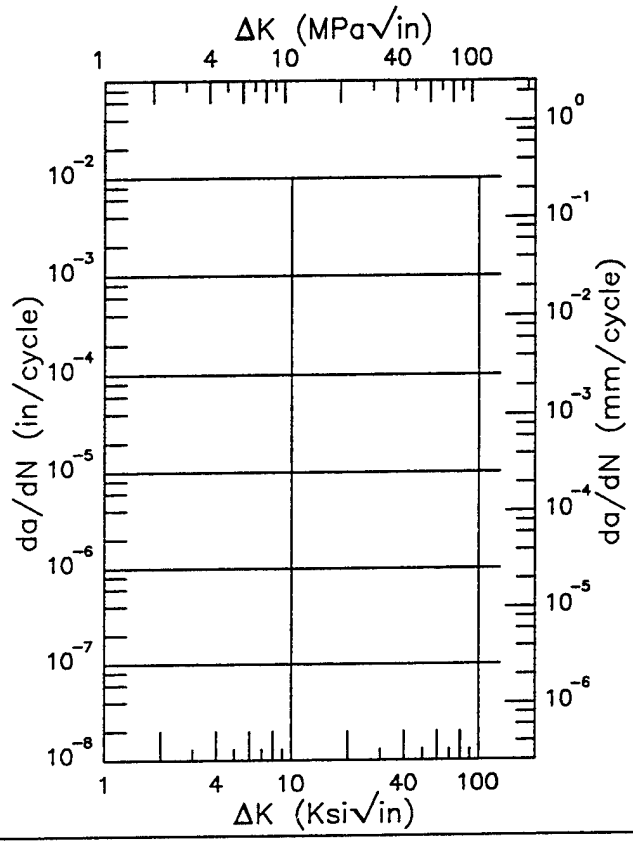
Ti–8Al–1Mo–1V

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 43 Hz
Environment: LAB AIR; RT

Yield Strength: 140 ksi
Ult. Strength: 149.2 ksi
Specimen Thk: 0.064 in.
Specimen Width: 3 in.
Ref: 86099

(1 of 1)





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
17.97 (min)	5.41
20.	7.92
25.	10.5
30.	13.6
35.	25.8
40.	61.9
50.	239.
60.	792.
62.14 (max)	1190.

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 13.38

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error:

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.21.3.1.5

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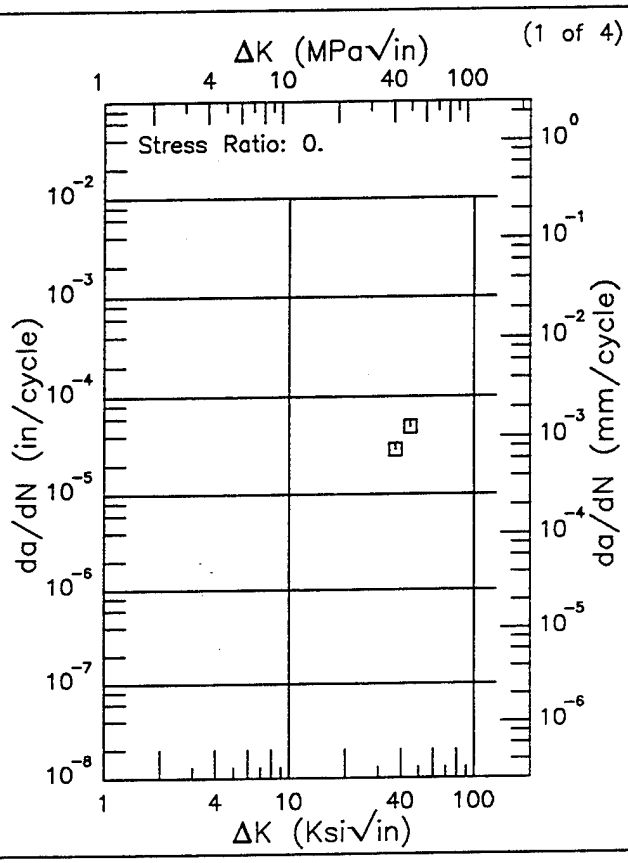
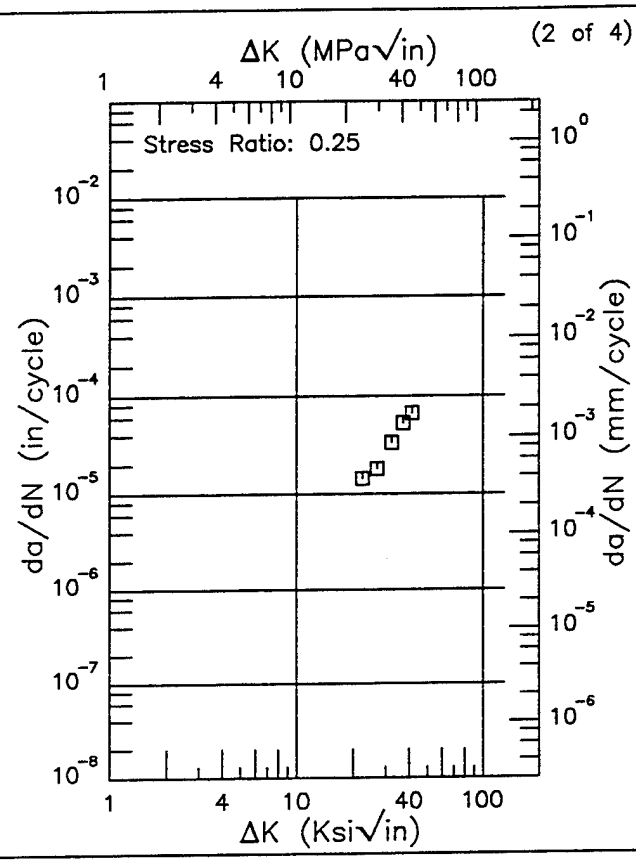
R

Ti–8Al–1Mo–1V

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 4 in.
Ref: 86099





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

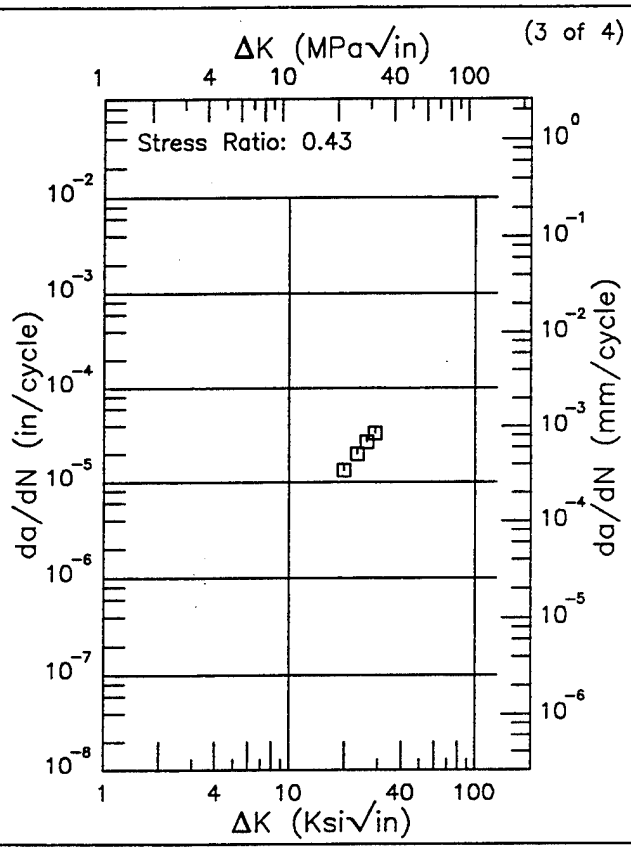
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

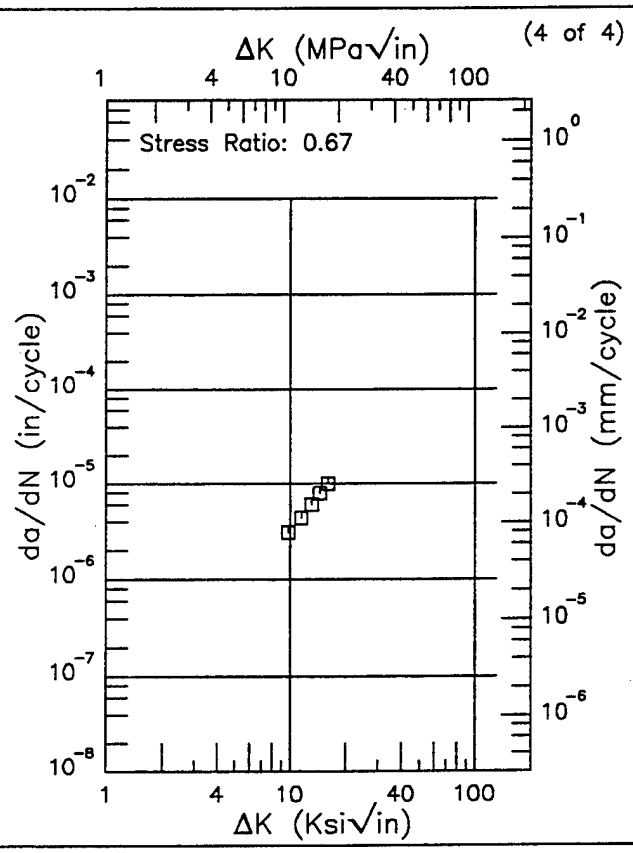
Figure 6.21.3.1.6

Ti–8Al–1Mo–1V R

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 4 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

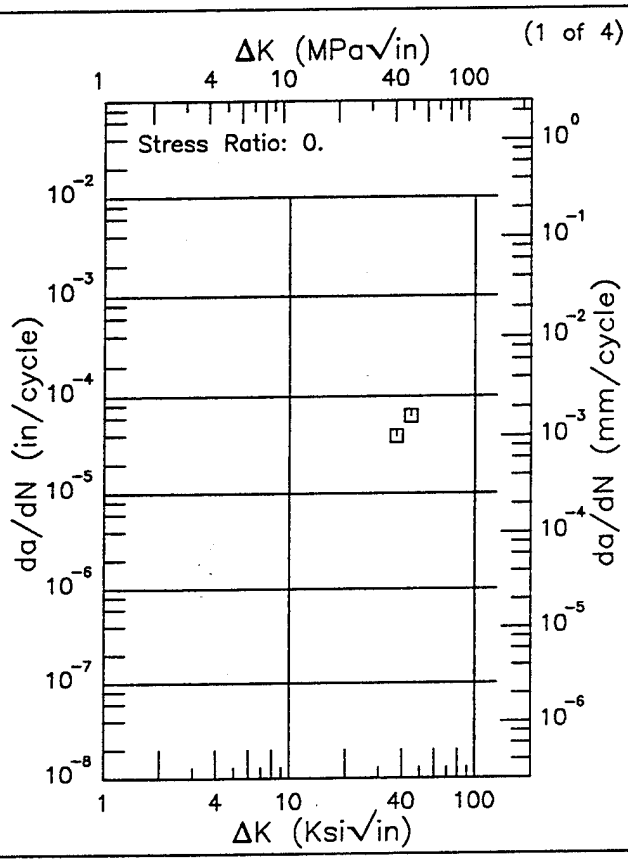
Figure 6.21.3.1.6 (Concluded)

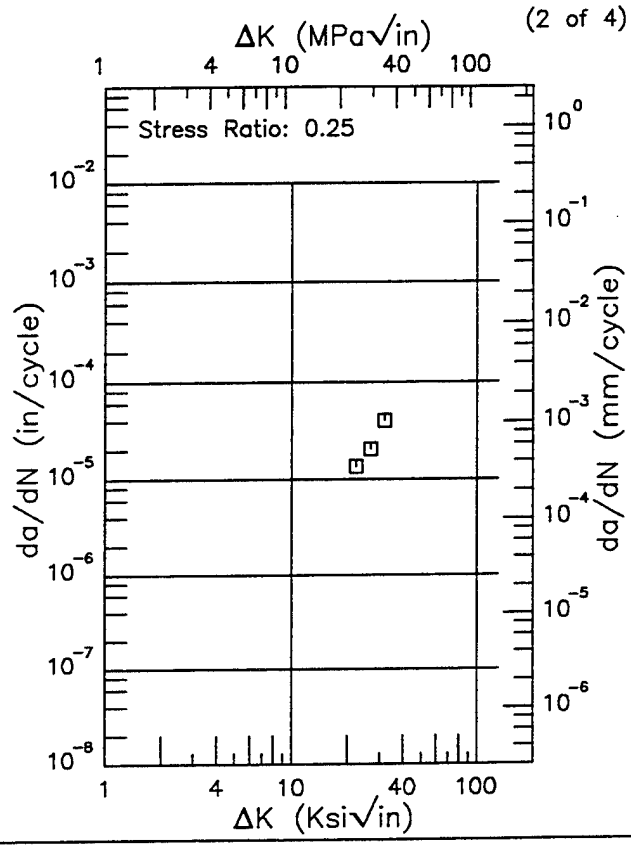
R

Ti–8Al–1Mo–1V

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 7.992 in.
Ref: 86099





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

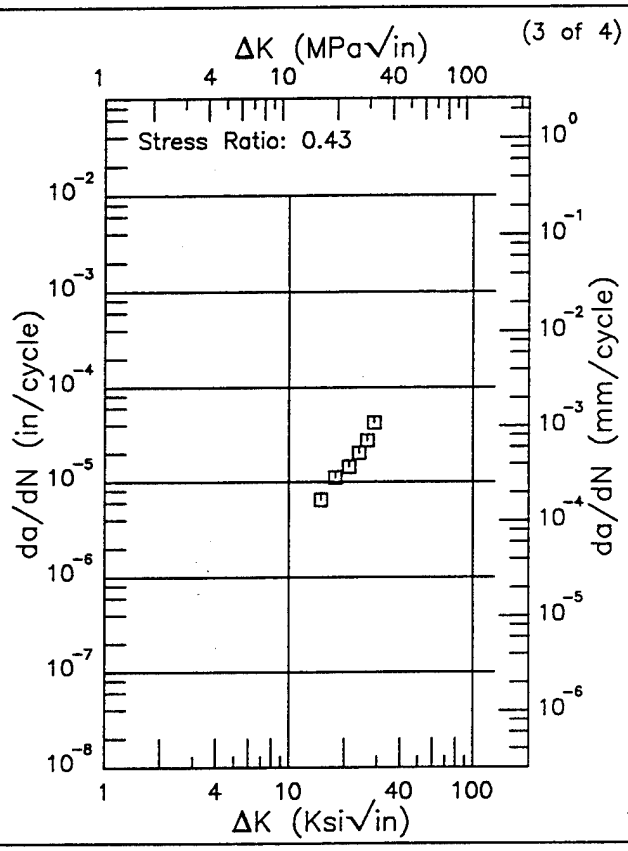
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

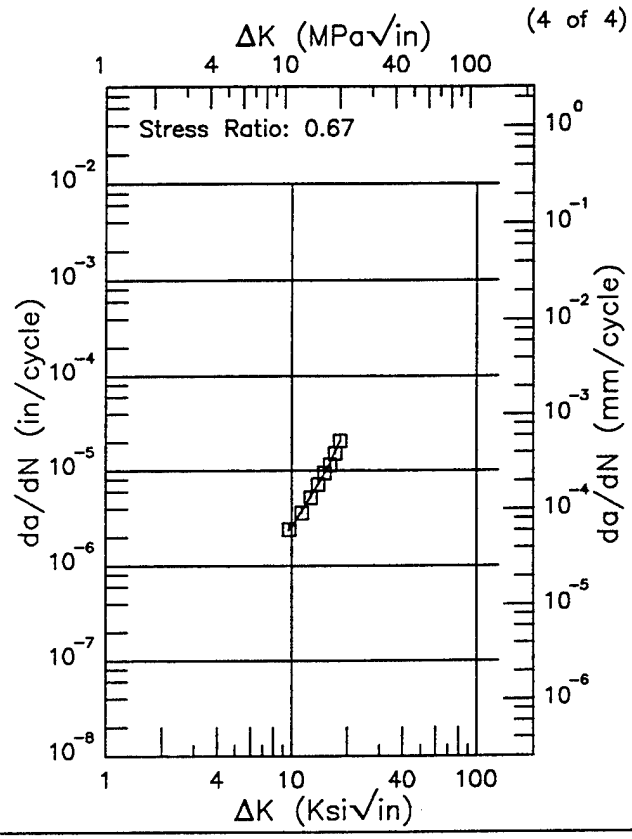
Figure 6.21.3.1.7

Ti–8Al–1Mo–1V R

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 7.992 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
9.65 (min)	2.38
10.	2.54
13.	5.76
16.	11.3
18.26 (max)	20.3

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.	2.13	0. .5 .8 1.25 2.

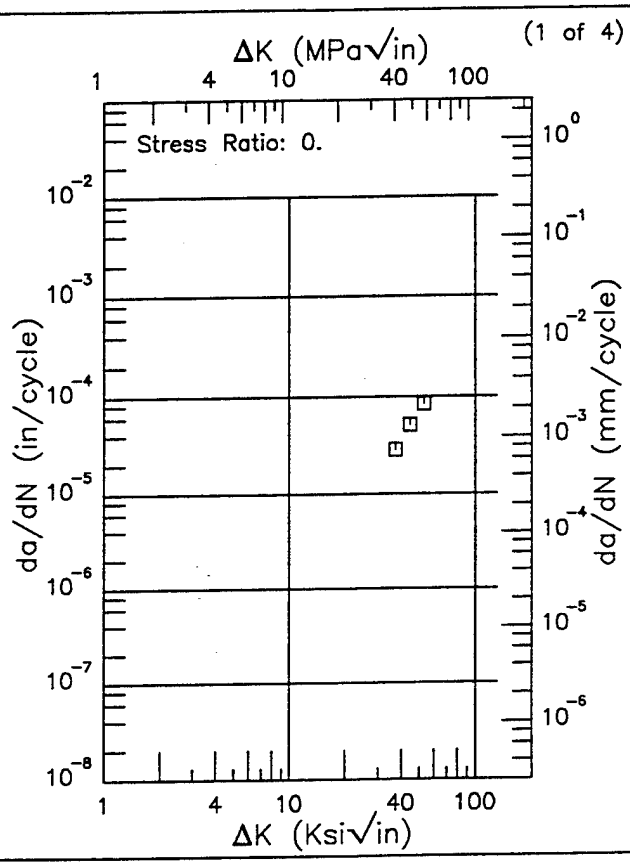
Figure 6.21.3.1.7 (Concluded)

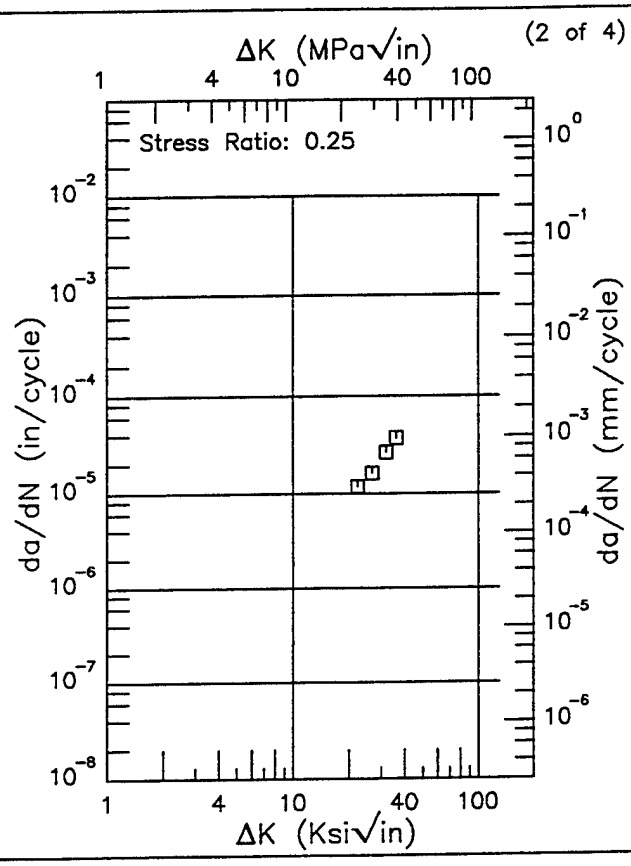
R

Ti–8Al–1Mo–1V

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 20 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 133.7 ksi
Ult. Strength: 152.1 ksi
Specimen Thk: 0.05 in.
Specimen Width: 7.992 in.
Ref: 86099





ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

ΔK (Ksi√in) da/dN (10^{-6}in/cycle)

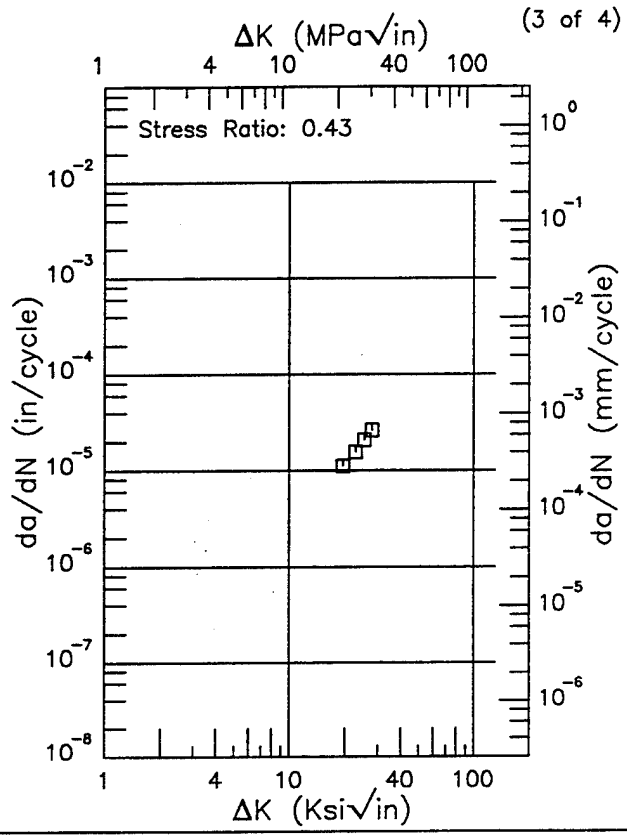
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

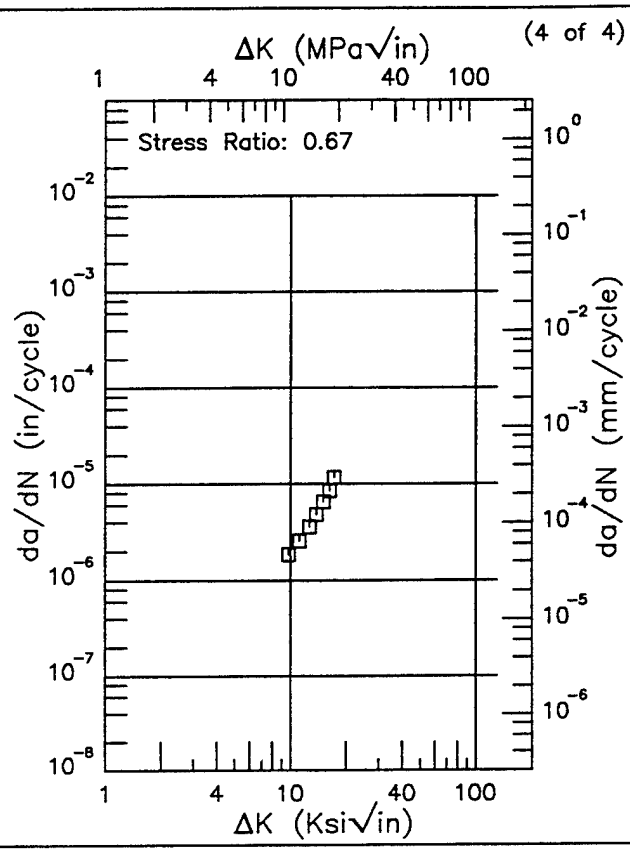
Figure 6.21.3.1.8

Ti–8Al–1Mo–1V R

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 20 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 133.7 ksi
Ult. Strength: 152.1 ksi
Specimen Thk: 0.05 in.
Specimen Width: 7.992 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

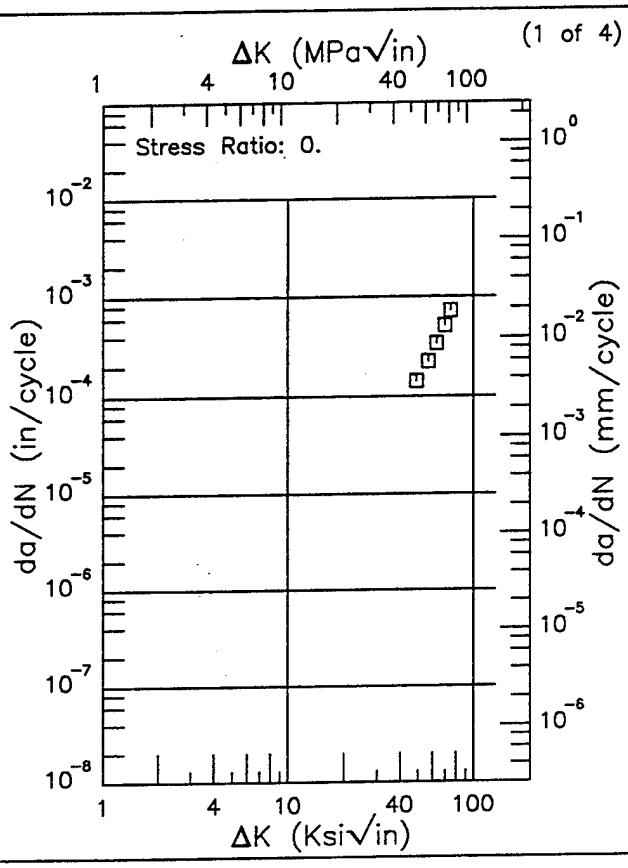
Figure 6.21.3.1.8 (Concluded)

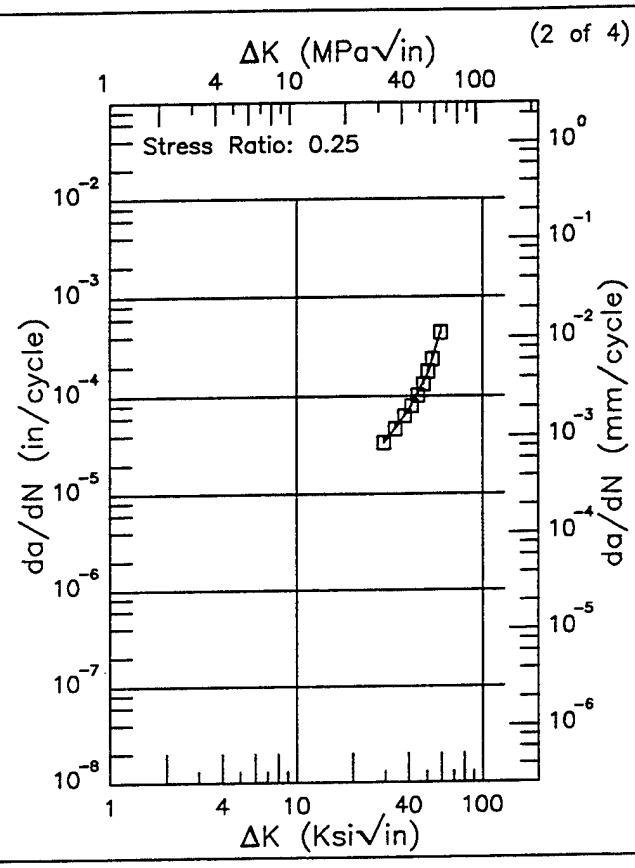
R

Ti–8Al–1Mo–1V

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 20 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
29.33 (min)	33.3
30.	35.0
35.	51.1
40.	72.1
50.	161.
59.13 (max)	435.

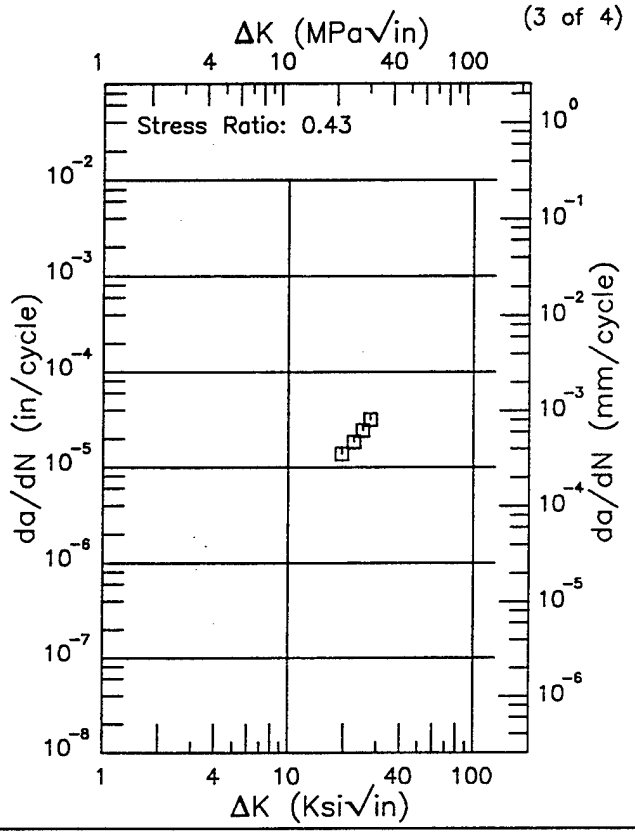
RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.	2.98	0. .5 .8 1.25 2.

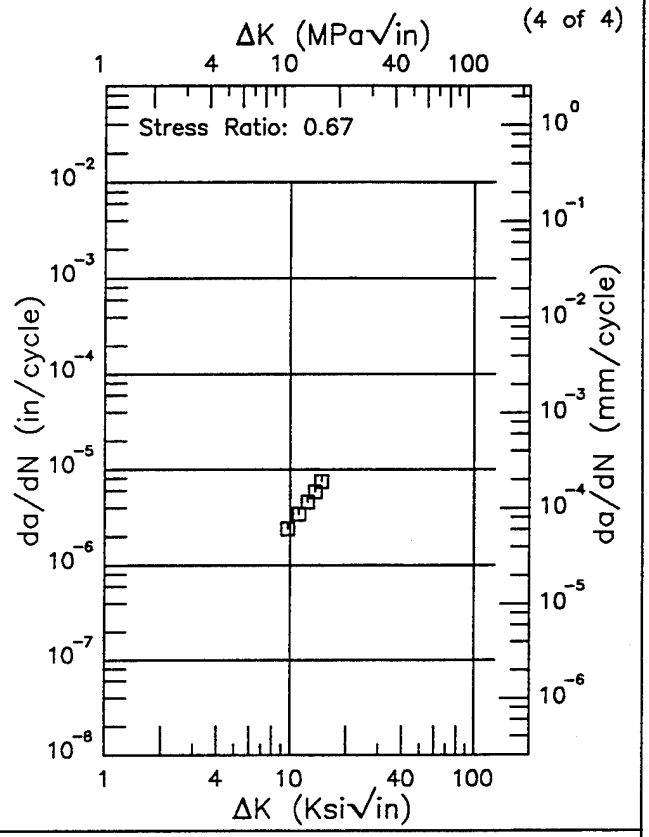
Figure 6.21.3.1.9

Ti–8Al–1Mo–1V R

Condition/Ht: DA
Form: 0.05 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 1 – 30 Hz
Environment: LAB AIR; RT

Yield Strength: 136.3 ksi
Ult. Strength: 150.7 ksi
Specimen Thk: 0.05 in.
Specimen Width: 20 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)	ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error	Life Prediction Ratio Summary	RMS % Error	Life Prediction Ratio Summary
	0. .5 .8 1.25 2.		0. .5 .8 1.25 2.

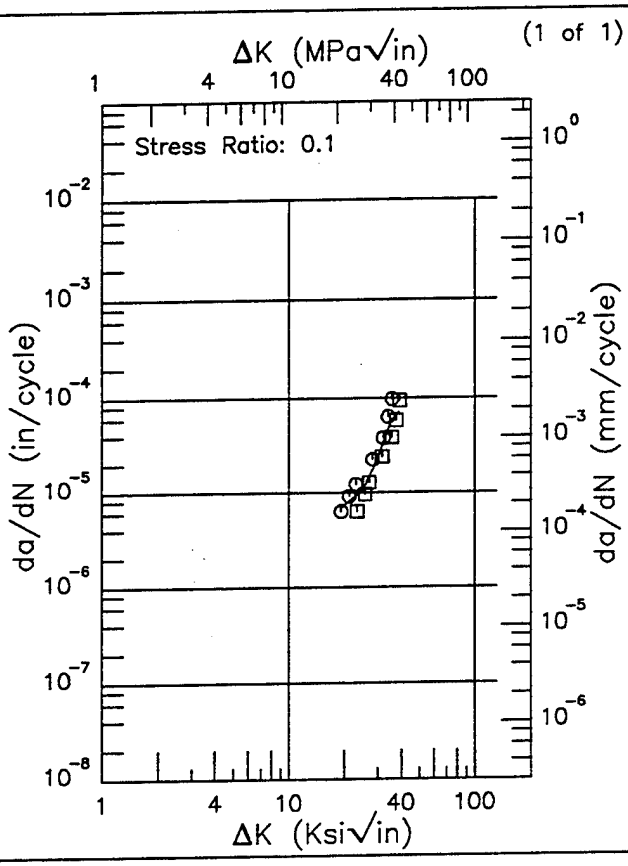
Figure 6.21.3.1.9 (Concluded)

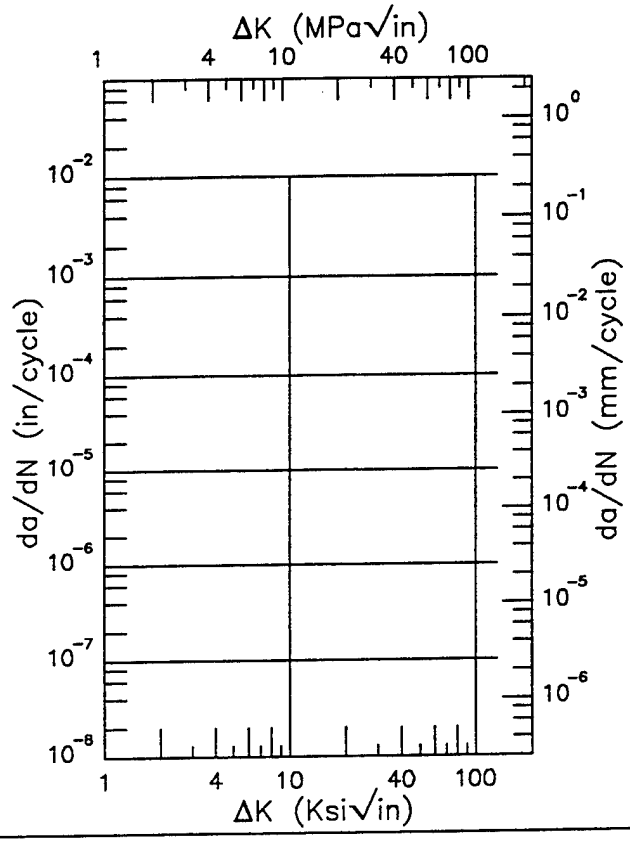
Ti–8Al–1Mo–1V

R

Condition/Ht: MA
Form: 0.02 in. Sheet
Specimen Type: CCP (max load specified)
Orientation: L–T
Frequency: 43 Hz
Environment: LAB AIR; RT

Yield Strength: 154.9 ksi
Ult. Strength: 159.2 ksi
Specimen Thk: 0.018 in.
Specimen Width: 3 in.
Ref: 86099





ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)
19.10 (min)	6.85
20.	7.30
25.	10.7
30.	23.0
35.	56.6
39.05 (max)	71.1

ΔK (Ksi√in)	da/dN (10^{-6}in/cycle)

RMS % Error: 29.51

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

RMS % Error

Life Prediction Ratio Summary: 0. .5 .8 1.25 2.

Figure 6.21.3.1.10

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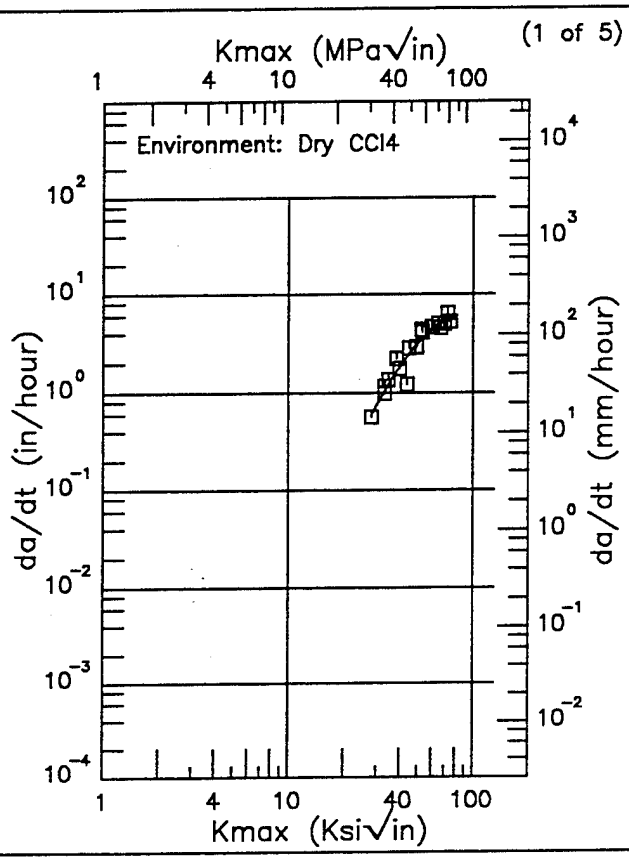
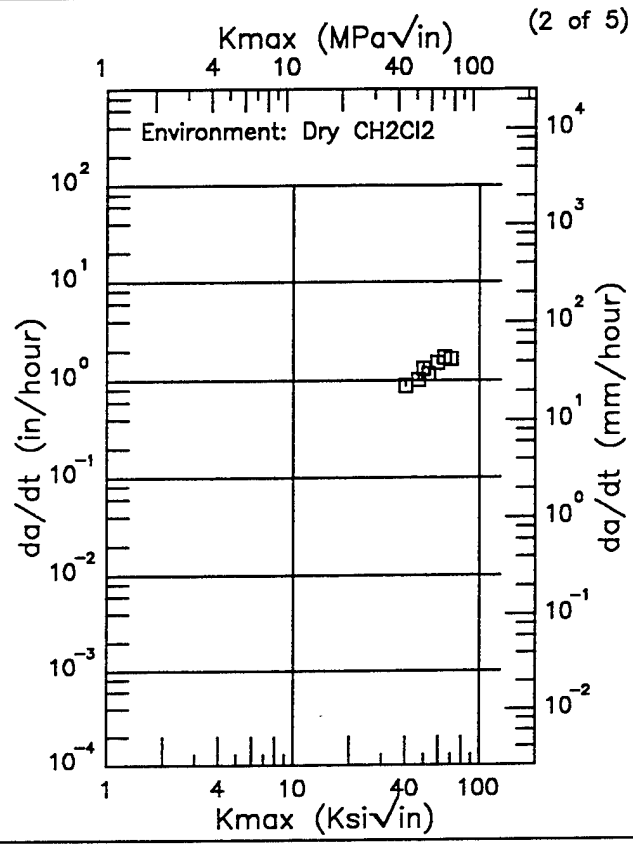
Ti–8Al–1Mo–1V

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
28.00 (min)	581.
30.	751.
35.	1259.
40.	1854.
50.	3149.
60.	4395.
70.	5470.
74.50 (max)	5887.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
19.99	

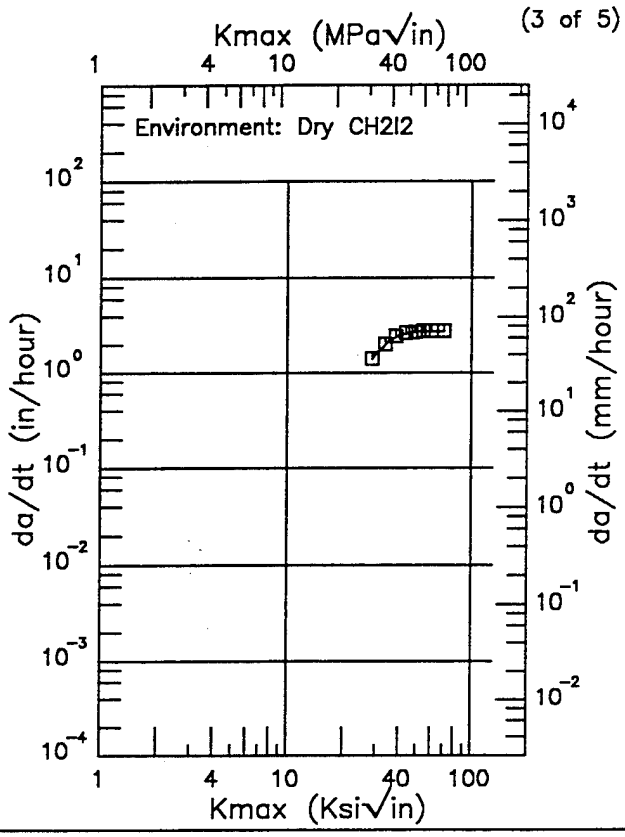
RMS % Error	

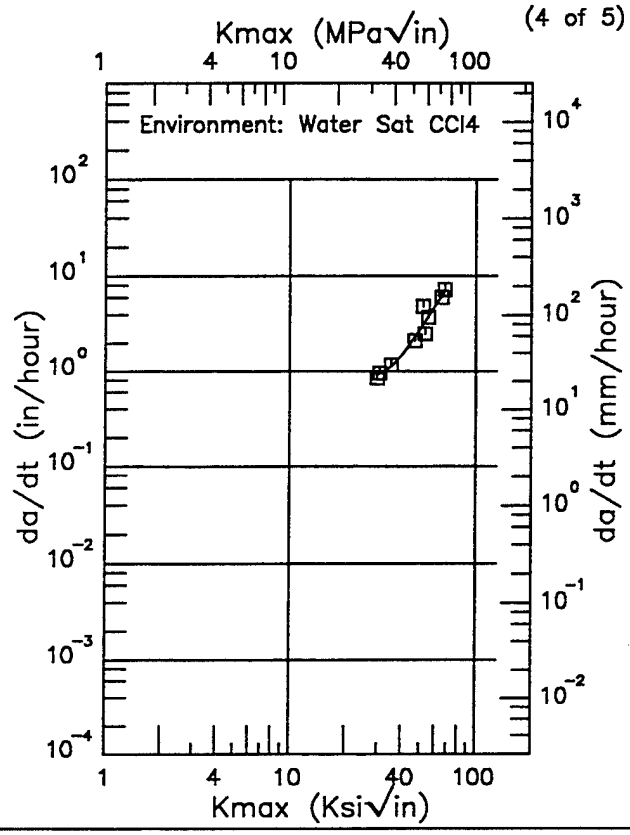
Figure 6.21.3.2.1

Ti–8Al–1Mo–1V

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
28.50 (min)	1394.
30.	1601.
35.	2163.
40.	2507.
50.	2739.
60.	2740.
70.00 (max)	2753.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
29.50 (min)	926.
30.	933.
35.	1118.
40.	1482.
50.	2779.
60.	4880.
67.50 (max)	6868.

RMS % Error	
1.13	

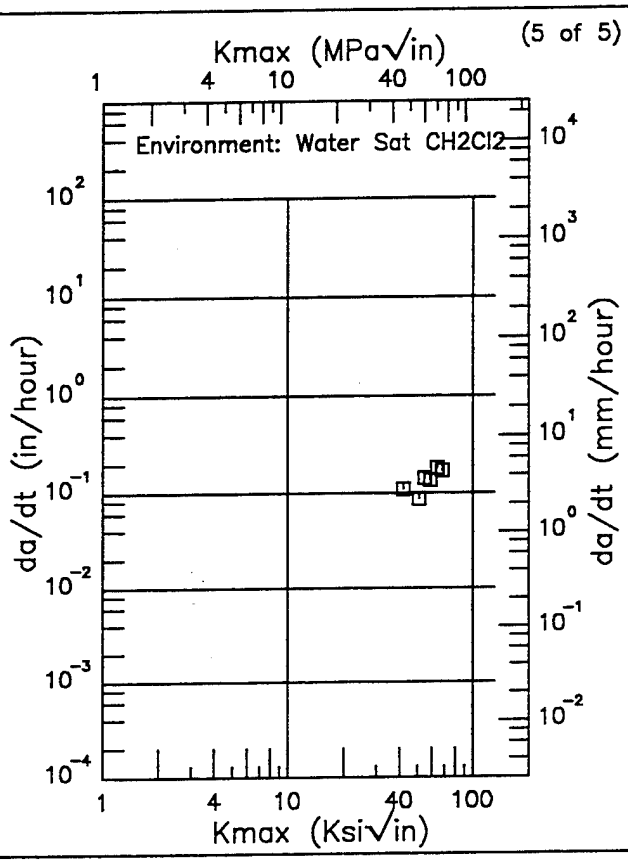
RMS % Error	
20.21	

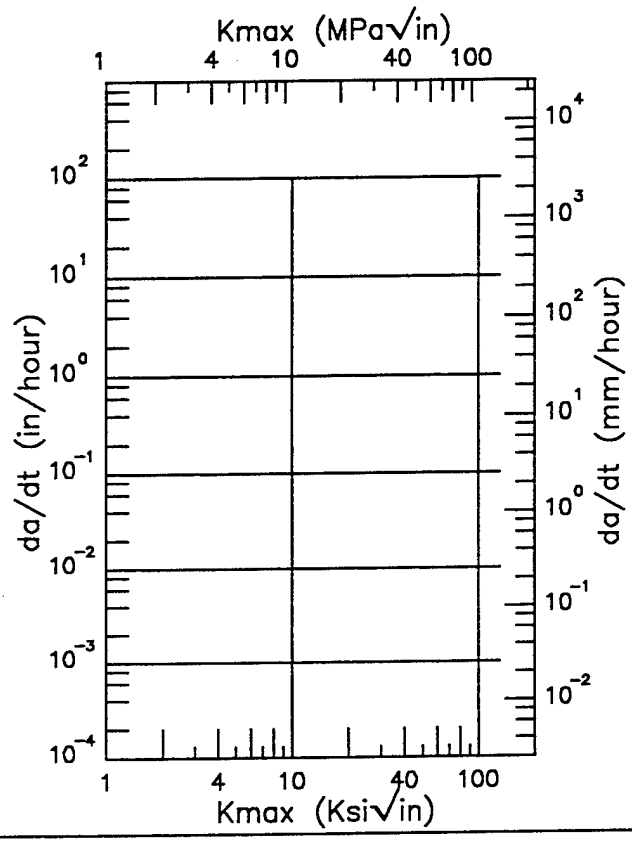
Figure 6.21.3.2.1 (Continued)

Ti–8Al–1Mo–1V

Condition/Ht:
Form:
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk:
Specimen Width:
A_o:
K_{Iscc}:
Ref: 82651





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)	Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

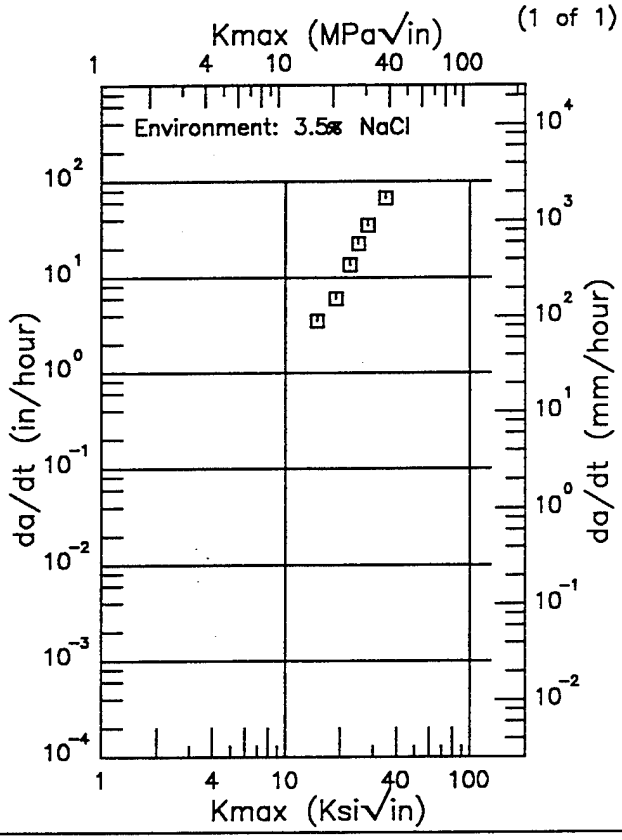
RMS % Error		RMS % Error	

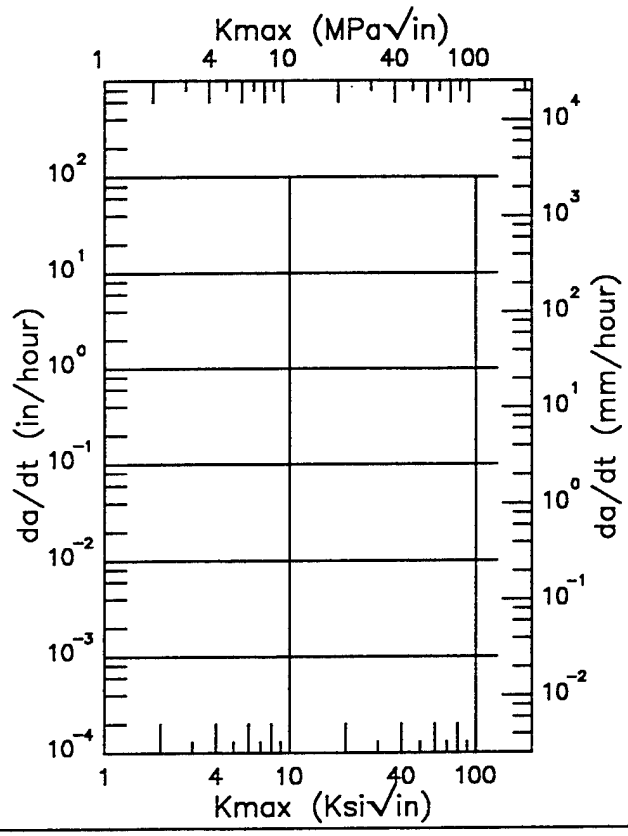
Figure 6.21.3.2.1 (Concluded)

Ti–8Al–1Mo–1V

Condition/Ht:
Form: 0.13 in. Sheet
Specimen Type: SENT
Orientation:
Yield Strength: 150 ksi
Ult. Strength:

Specimen Thk: 0.125 in.
Specimen Width: 3 in.
A_o:
K_{Iscc}: 22 ksi
Ref: 77456





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)	Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

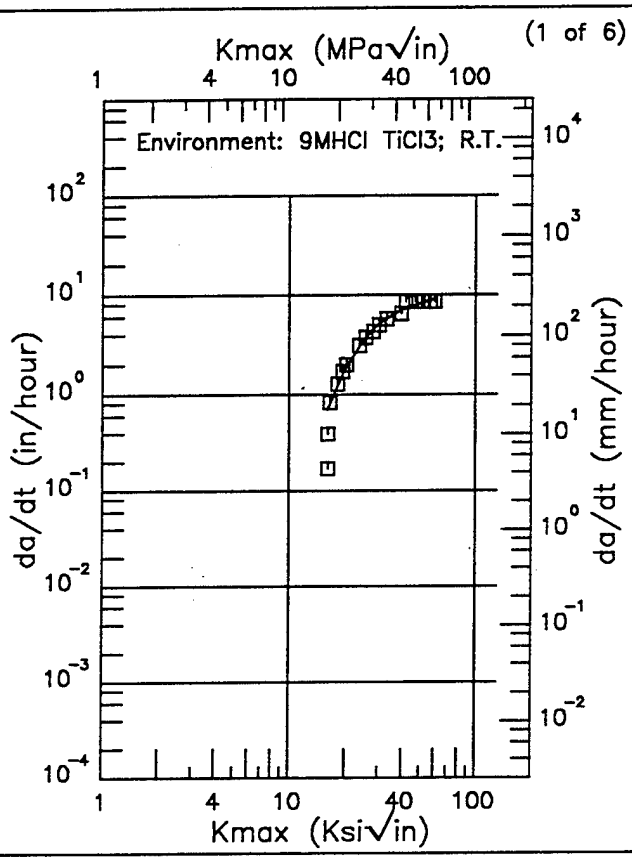
RMS % Error		RMS % Error	

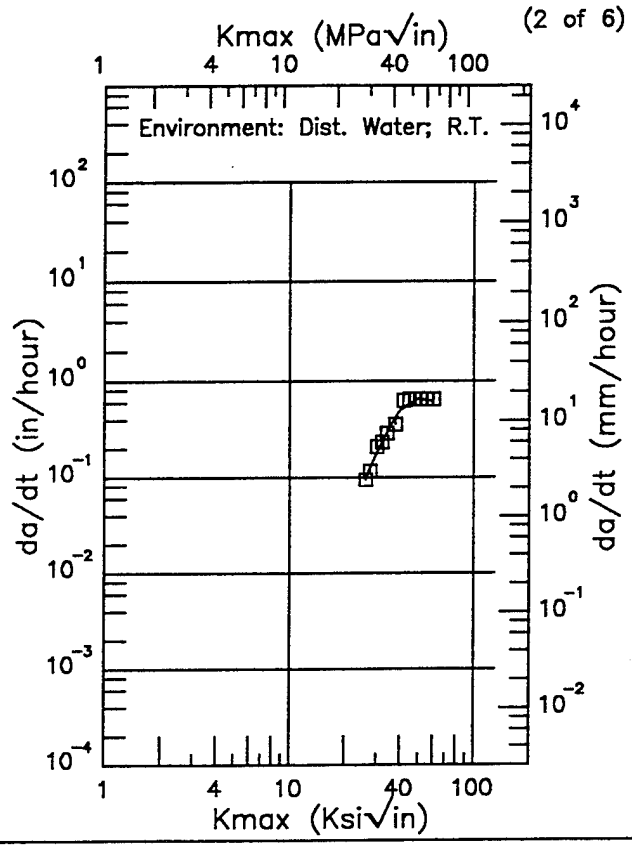
Figure 6.21.3.2.2

Ti–8Al–1Mo–1V

Condition/Ht: 1520F 1HR WQ
Form: 0.25 in. Plate
Specimen Type: DCB
Orientation:
Yield Strength: 124 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 83689





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
16.00 (min)	700.
20.	1848.
25.	3569.
30.	5098.
35.	6260.
40.	7104.
50.	8238.
60.00 (max)	9154.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
26.00 (min)	96.2
30.	179.
35.	330.
40.	498.
50.	659.
60.00 (max)	626.

RMS % Error	
22.24	

RMS % Error	
9.79	

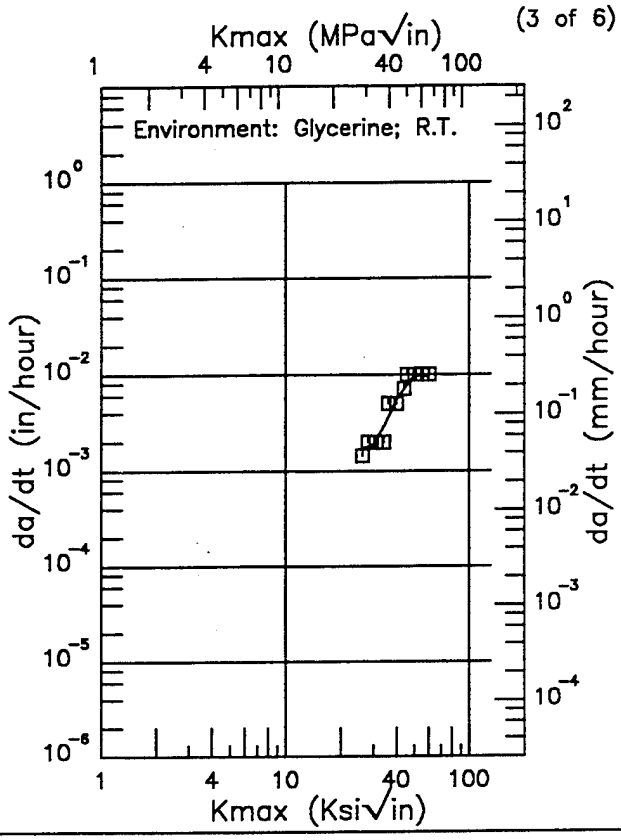
Figure 6.21.3.2.3

Ti–8Al–1Mo–1V

Condition/Ht: 1520F 1HR WQ
Form: 0.25 in. Plate
Specimen Type: DCB
Orientation:
Yield Strength: 124 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 83689

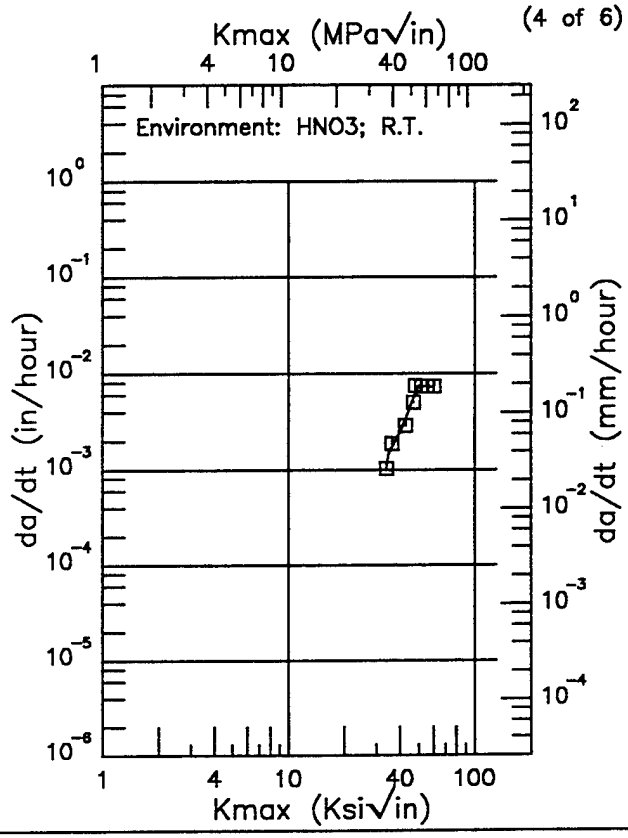
(3 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
26.00 (min)	1.70
30.	1.87
35.	3.14
40.	5.46
50.	9.93
60.00 (max)	9.53

RMS % Error
18.77

(4 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
33.80 (min)	1.02
35.	1.51
40.	2.45
50.	7.50
60.00 (max)	7.29

RMS % Error
10.49

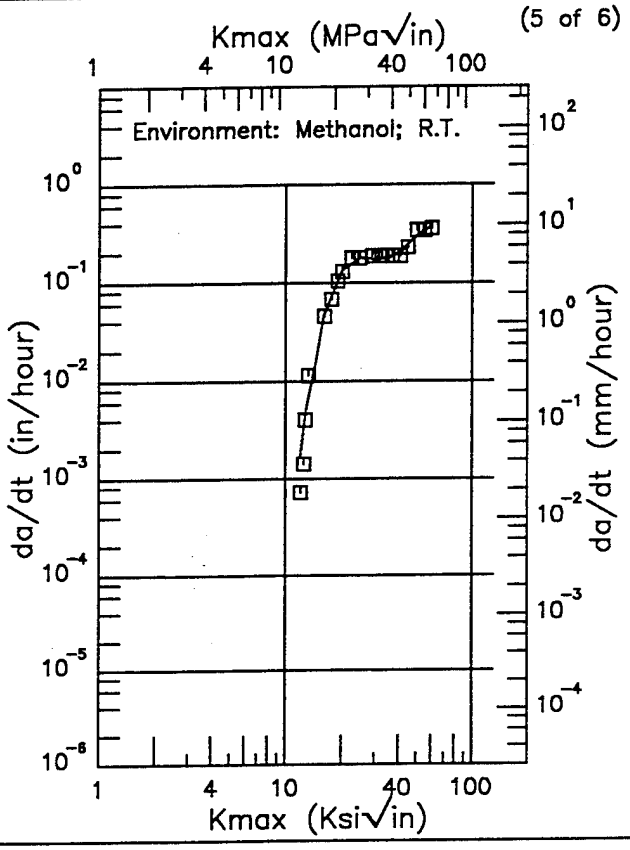
Figure 6.21.3.2.3 (Continued)

Ti–8Al–1Mo–1V

Condition/Ht: 1520F 1HR WQ
Form: 0.25 in. Plate
Specimen Type: DCB
Orientation:
Yield Strength: 124 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width:
A_o:
K_{Iscc}:
Ref: 83689

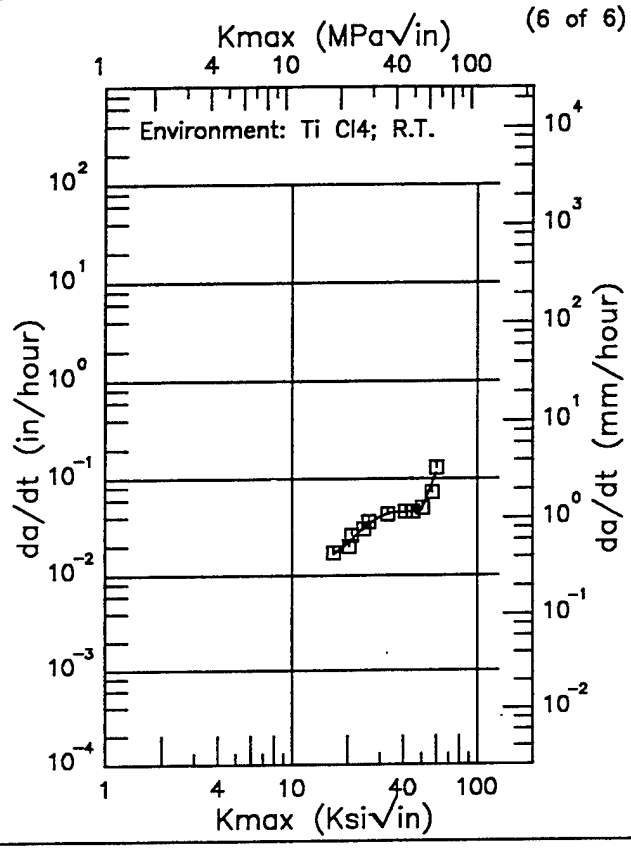
(5 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
12.00 (min)	1.68
13.	5.53
16.	46.2
20.	135.
25.	179.
30.	175.
35.	175.
40.	201.
50.	298.
60.00 (max)	373.

RMS % Error
26.75

(6 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
16.80 (min)	16.7
20.	21.5
25.	31.6
30.	40.5
35.	44.6
40.	45.4
50.	47.4
60.00 (max)	115.

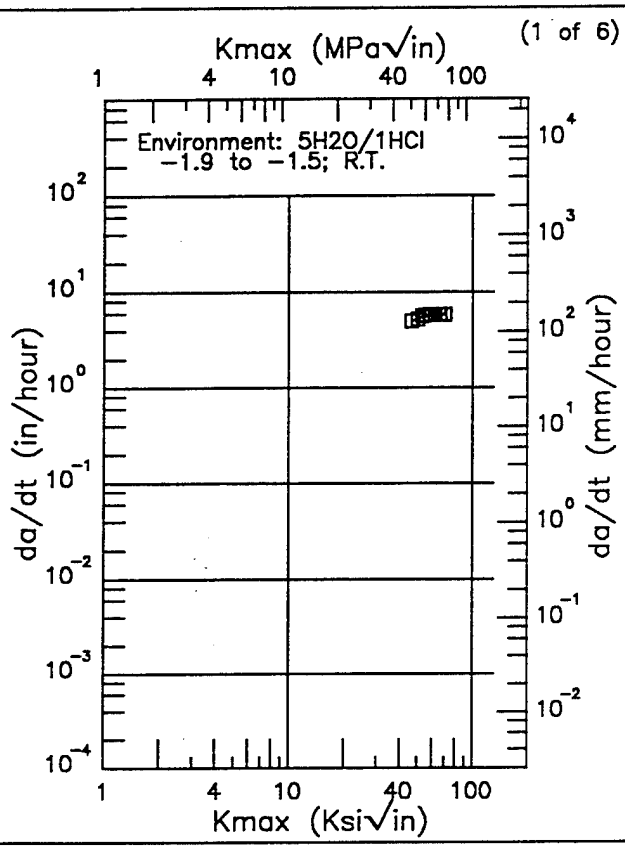
RMS % Error
8.49

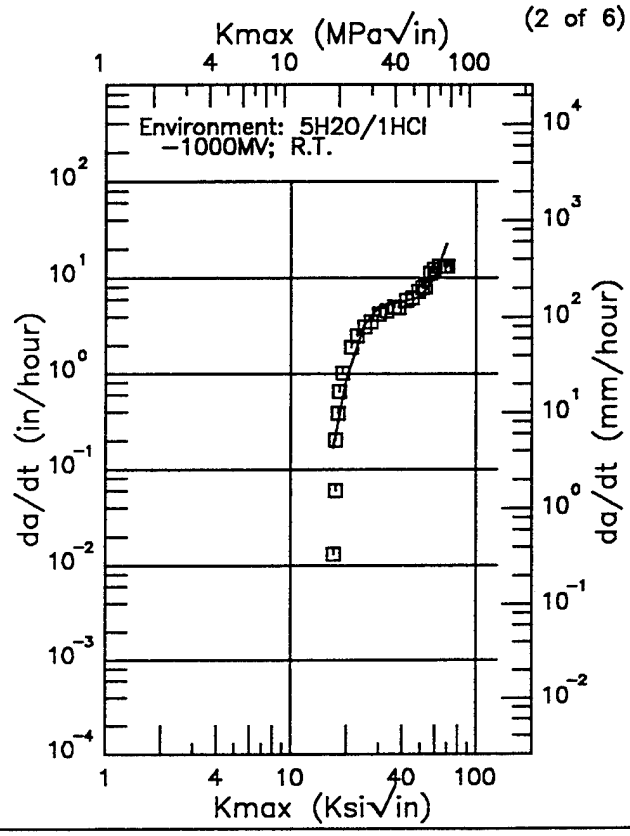
Figure 6.21.3.2.3 (Concluded)

Ti–8Al–1Mo–1V

Condition/Ht: 1520F 1HR WQ
Form: 0.25 in. Plate
Specimen Type: DCB
Orientation: T–L
Yield Strength: 124 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 1 in.
A_o: 0.985 in.
K_{Iscc}:
Ref: 83689





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
46.50 (min)	4980.
50.	5251.
60.	5848.
70.00 (max)	5819.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
17.00 (min)	168.
20.	903.
25.	3256.
30.	4993.
35.	5561.
40.	5665.
50.	6453.
60.	10102.
70.00 (max)	22488.

RMS % Error	
1.56	

RMS % Error	
40.62	

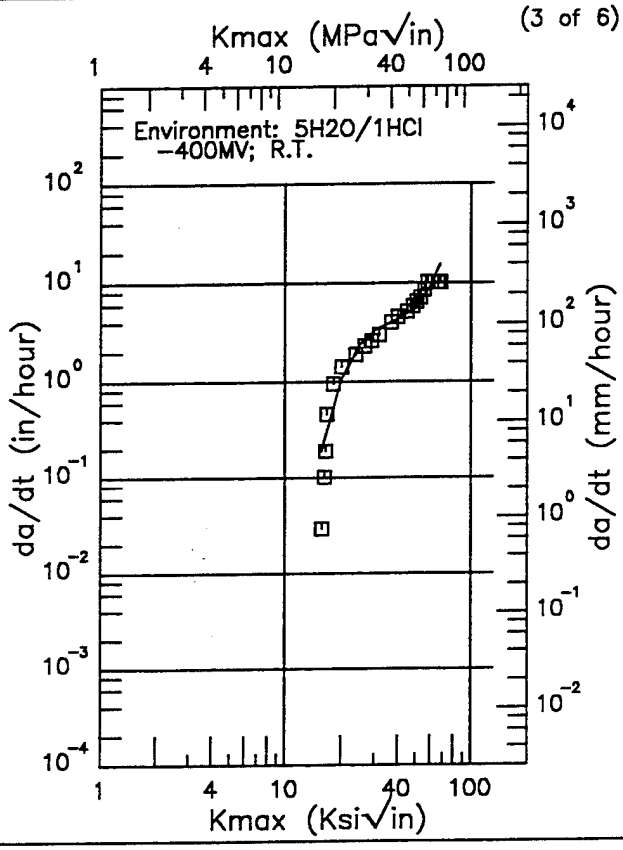
Figure 6.21.3.2.4

Ti–8Al–1Mo–1V

Condition/Ht: 1520F 1HR WQ
Form: 0.25 in. Plate
Specimen Type: DCB
Orientation: T–L
Yield Strength: 124 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 1 in.
A_o: 0.985 in.
K_{Iscc}:
Ref: 83689

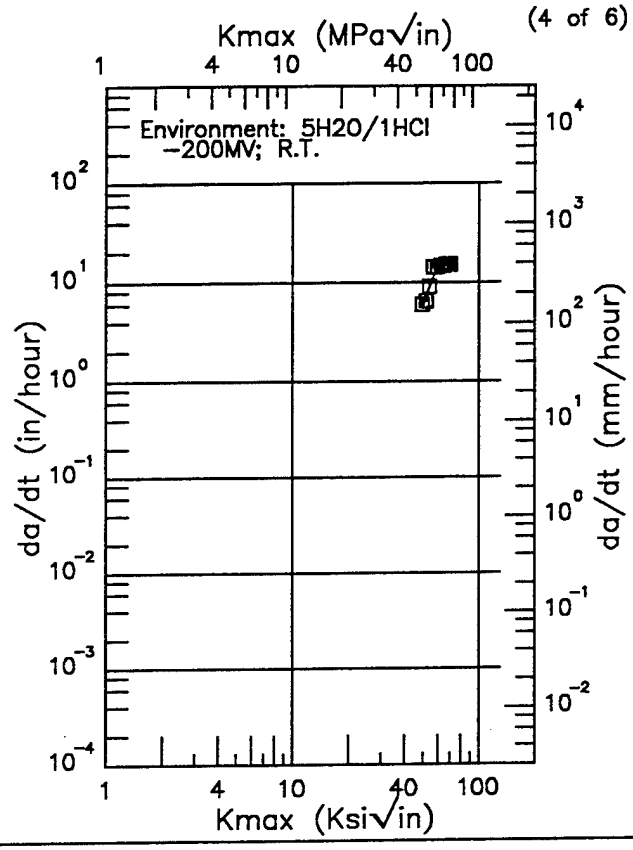
(3 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
15.70 (min)	190.
16.	225.
20.	1047.
25.	2394.
30.	3328.
35.	3861.
40.	4278.
50.	5633.
60.	9067.
68.00 (max)	15513.

RMS % Error
35.81

(4 of 6)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
49.50 (min)	5721.
50.	5869.
60.	15346.
70.00 (max)	16018.

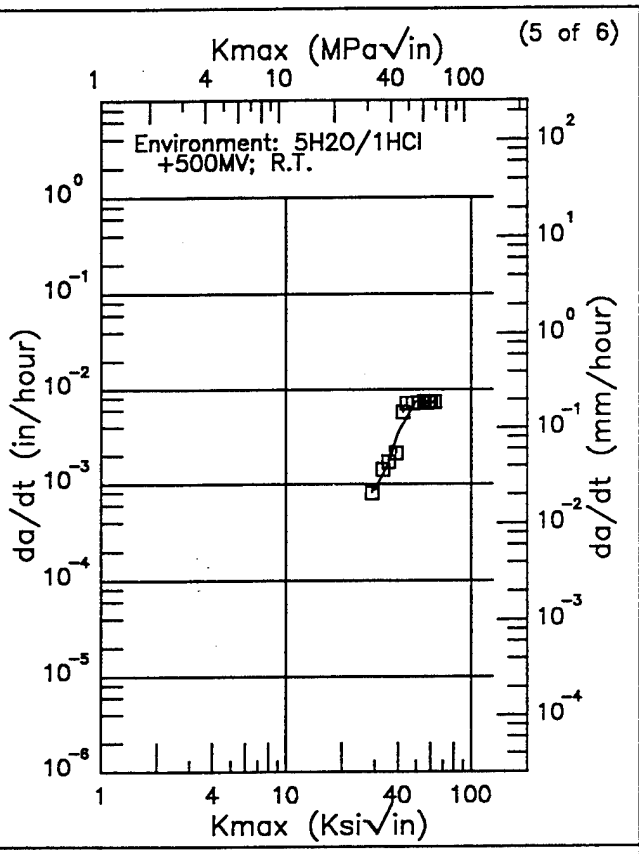
RMS % Error
8.89

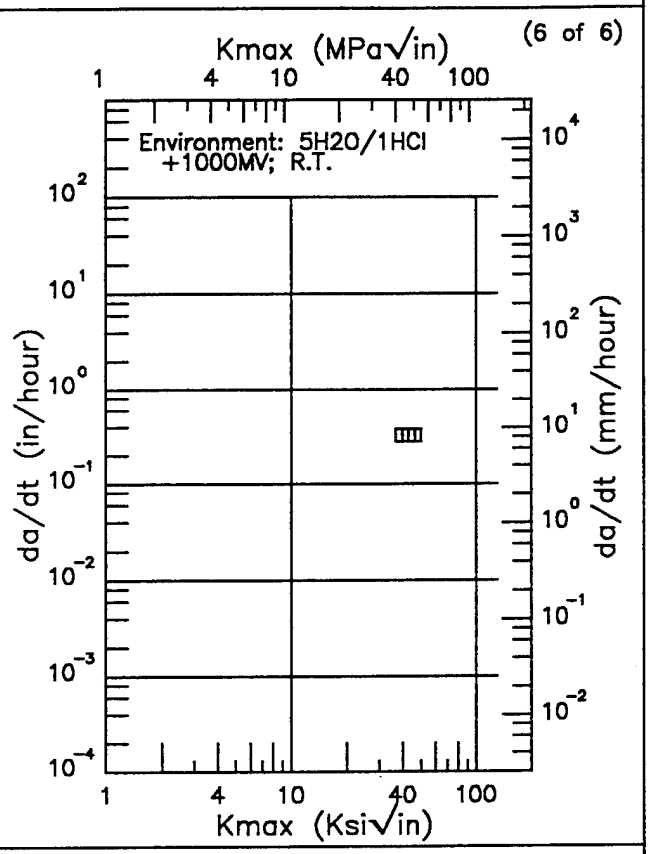
Figure 6.21.3.2.4 (Continued)

Ti–8Al–1Mo–1V

Condition/Ht: 1520F 1HR WQ
Form: 0.25 in. Plate
Specimen Type: DCB
Orientation: T–L
Yield Strength: 124 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 1 in.
A_o: 0.985 in.
K_{Iscc}:
Ref: 83689





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
29.00 (min)	0.850
30.	0.871
35.	1.57
40.	3.46
50.	7.48
60.	7.20
63.00 (max)	7.30

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error
17.47

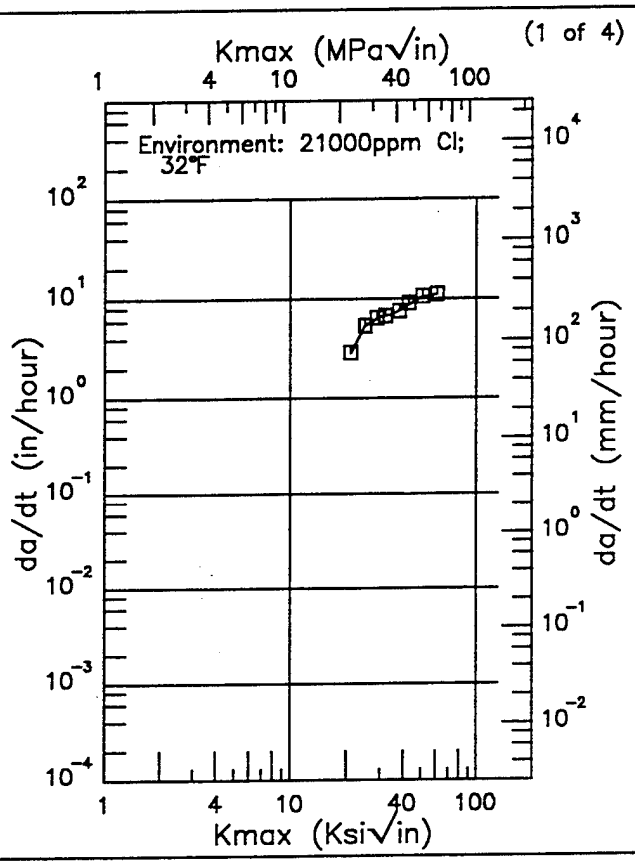
RMS % Error

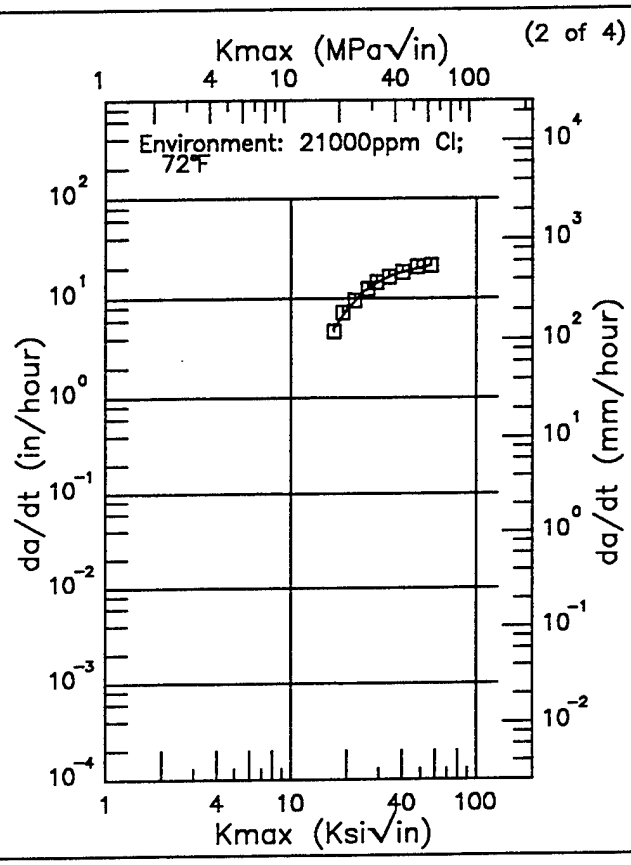
Figure 6.21.3.2.4 (Concluded)

Ti–8Al–1Mo–1V

Condition/Ht: 1725F FC 1200F 3HR WQ
Form: 0.25 in. Plate
Specimen Type: CB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 2 in.
A_O: 0.25 in.
K_{Iscc}:
Ref: 85855





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
21.00 (min)	2892.
25.	5436.
30.	6567.
35.	7067.
40.	8124.
50.	10376.
60.	11020.
61.00 (max)	10999.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
17.00 (min)	5014.
20.	7759.
25.	11801.
30.	14738.
35.	16734.
40.	18121.
50.	20090.
57.00 (max)	21366.

RMS % Error	
1.57	

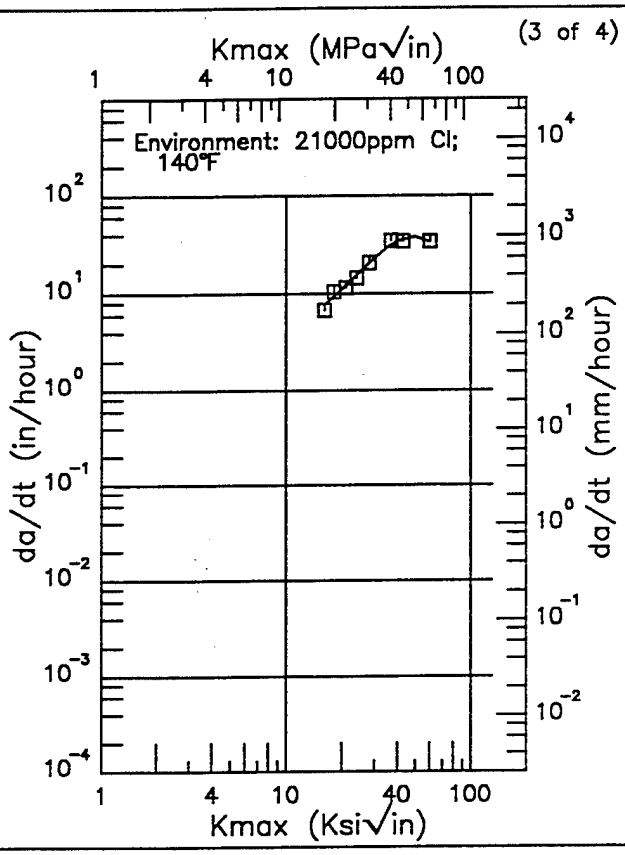
RMS % Error	
3.32	

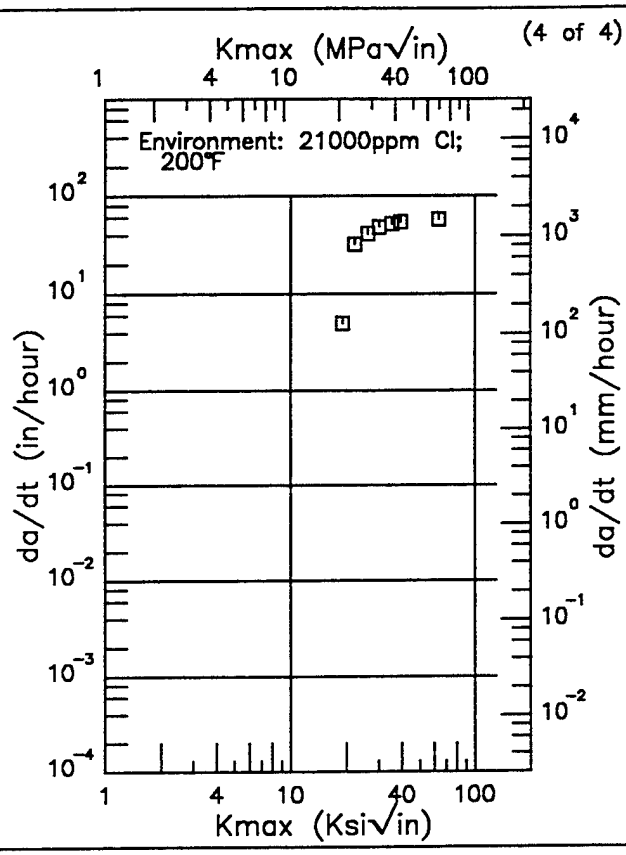
Figure 6.21.3.2.5

Ti–8Al–1Mo–1V

Condition/Ht: 1725F FC 1200F 3HR WQ
Form: 0.25 in. Plate
Specimen Type: CB
Orientation: T–L
Yield Strength:
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 2 in.
A_o: 0.25 in.
K_{Iscc}:
Ref: 85855





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
16.00 (min)	7709.
20.	10915.
25.	16530.
30.	23037.
35.	29281.
40.	34200.
50.	37827.
60.00 (max)	33748.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error 7.58

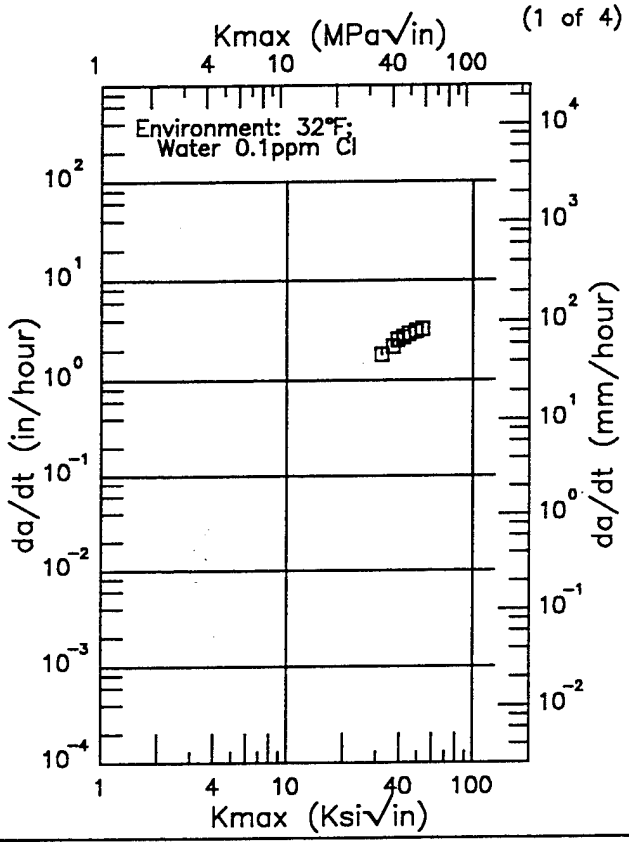
RMS % Error

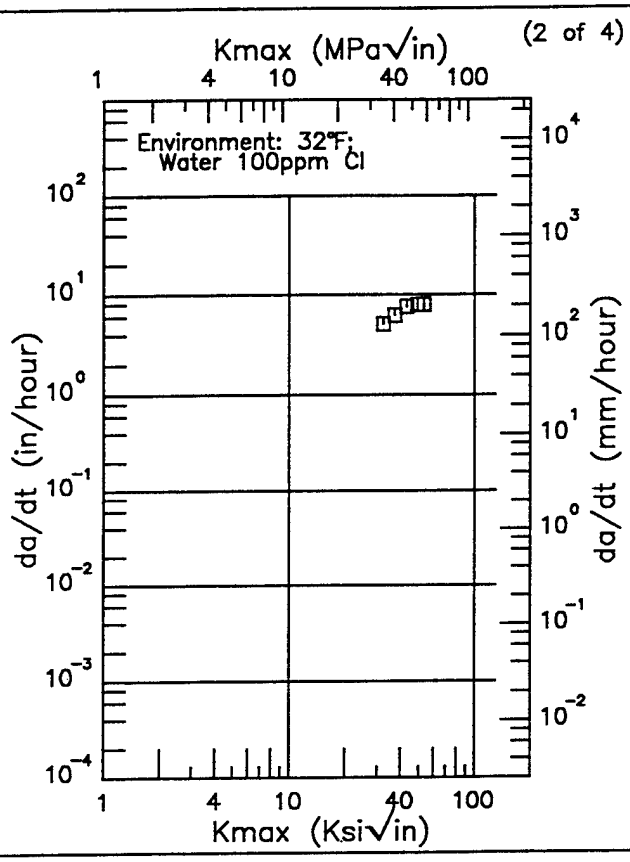
Figure 6.21.3.2.5 (Concluded)

Ti-8Al-1Mo-1V

Condition/Ht: 1725F FC 1200F 3HR WQ
Form: 0.25 in. Plate
Specimen Type: CB
Orientation: T-L
Yield Strength: 150 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 2 in.
A_o: 0.25 in.
K_{Iscc}:
Ref: 85855





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)	Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error		RMS % Error	

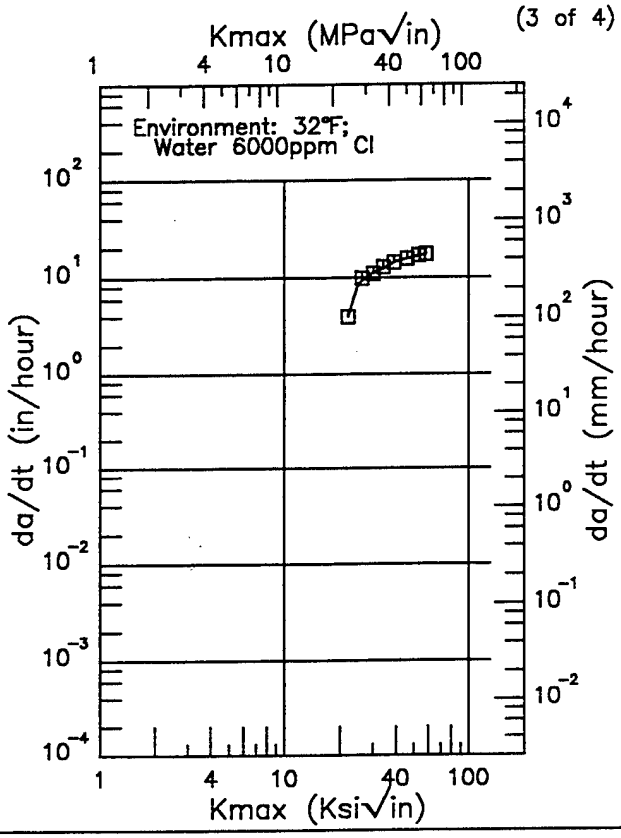
Figure 6.21.3.2.6

Ti–8Al–1Mo–1V

Condition/Ht: 1725F FC 1200F 3HR WQ
Form: 0.25 in. Plate
Specimen Type: CB
Orientation: T–L
Yield Strength: 150 ksi
Ult. Strength:

Specimen Thk: 0.25 in.
Specimen Width: 2 in.
A_o: 0.25 in.
K_{Iscc}:
Ref: 85855

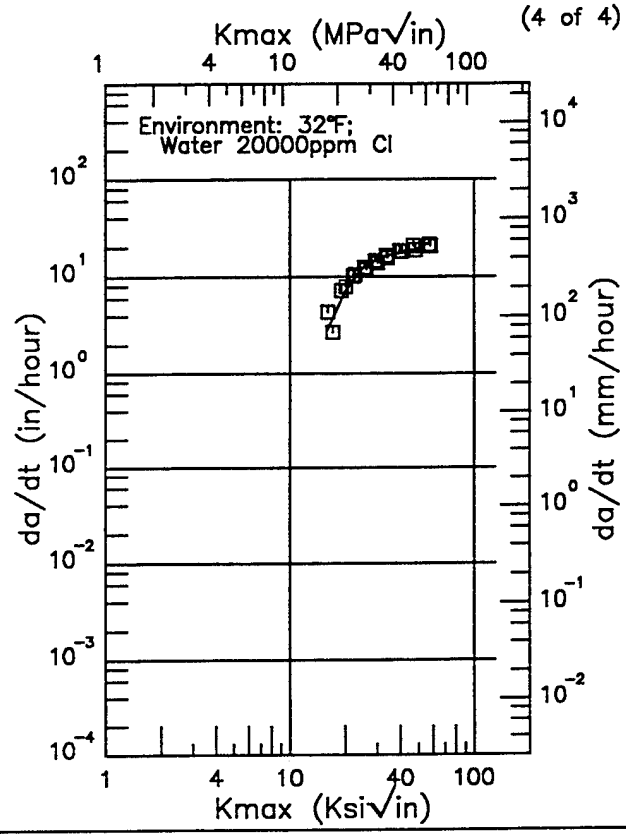
(3 of 4)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
22.00 (min)	3967.
25.	8666.
30.	11058.
35.	12665.
40.	14599.
50.	15992.
58.00 (max)	17297.

RMS % Error
2.56

(4 of 4)



Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
16.00 (min)	2834.
20.	7193.
25.	12129.
30.	15062.
35.	16543.
40.	17415.
50.	19351.
58.00 (max)	22251.

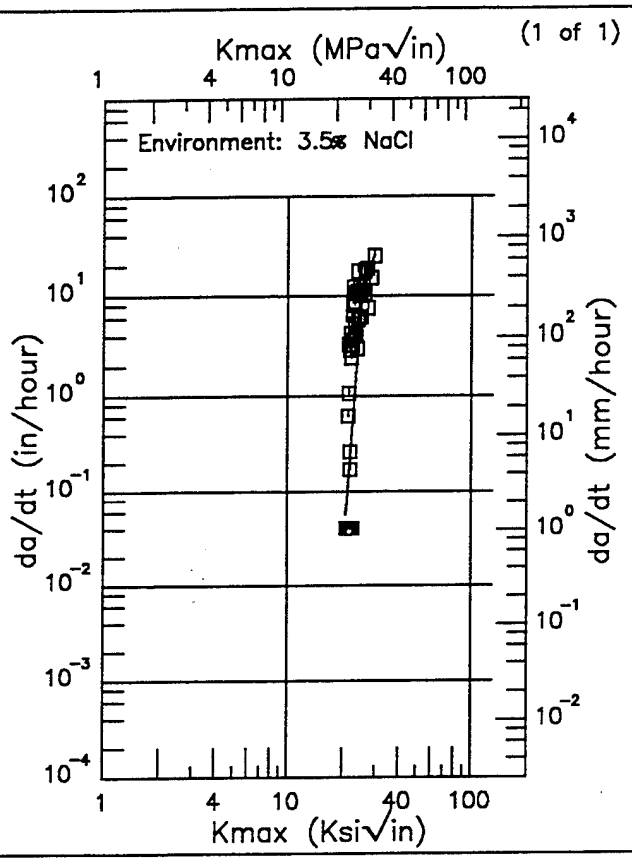
RMS % Error
16.05

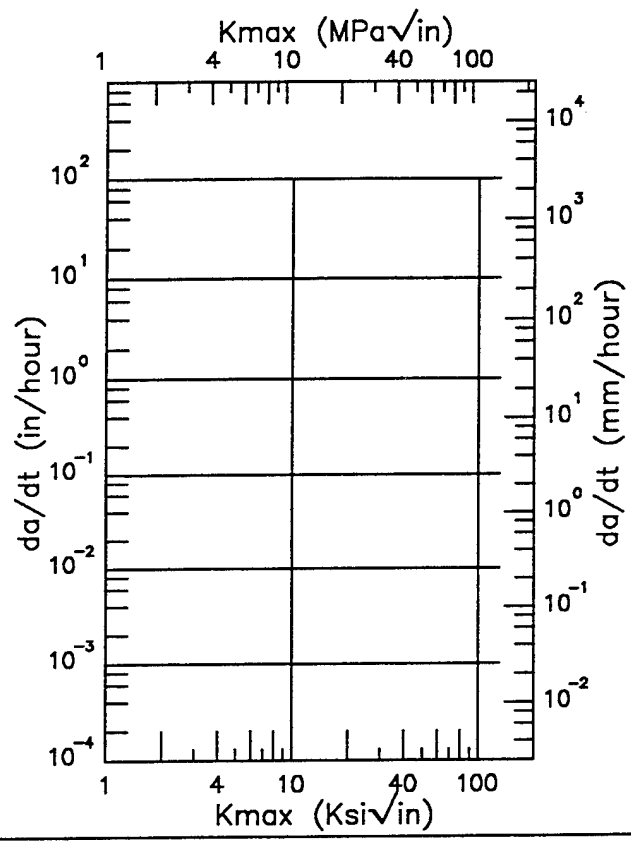
Figure 6.21.3.2.6 (Concluded)

Ti–8Al–1Mo–1V

Condition/Ht: MA
Form: 0.16 in. Sheet
Specimen Type: CCP (max load specified)
Orientation:
Yield Strength: 145 ksi
Ult. Strength:

Specimen Thk: 0.16 in.
Specimen Width: 8 in.
A_o:
K_{Iscc}: 21 ksi
Ref: 84290





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
20.80 (min)	56.1
25.	10876.
29.50 (max)	26046.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error	
>100.0	

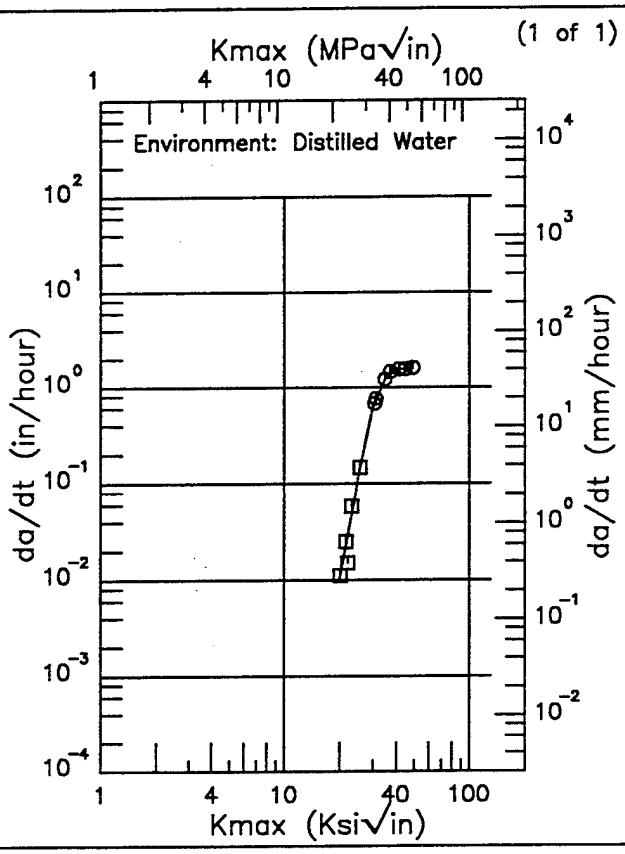
RMS % Error	

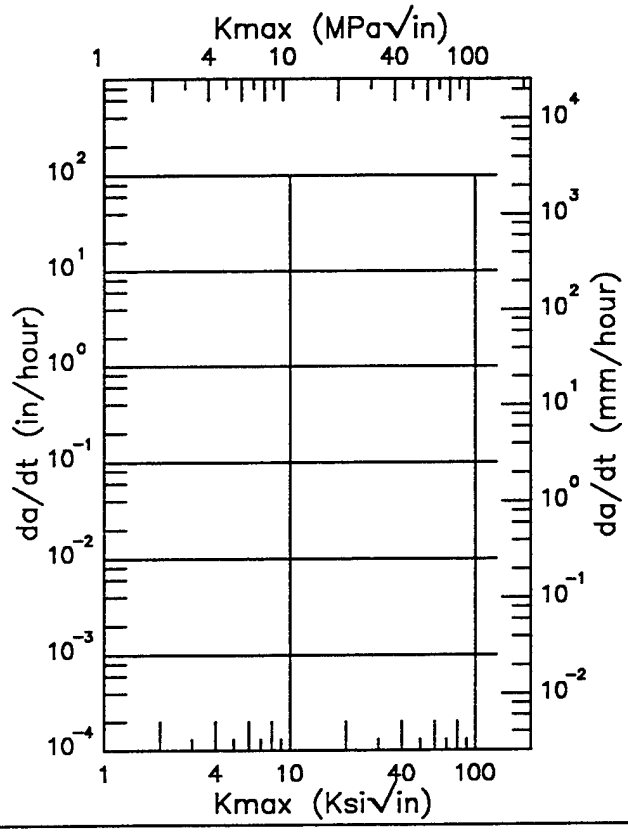
Figure 6.21.3.2.7

Ti–8Al–1Mo–1V

Condition/Ht: MA
Form: 0.27 in. Plate
Specimen Type: SENT
Orientation:
Yield Strength:
Ult. Strength:

Specimen Thk: 0.26 in.
Specimen Width: 2 in.
A_o:
K_{Iscc}:
Ref: 81741





Kmax (Ksi√in)	da/dt (10^{-3}in/hour)
20.00 (min)	10.3
25.	118.
30.	614.
35.	1261.
40.	1543.
49.00 (max)	1600.

Kmax (Ksi√in)	da/dt (10^{-3}in/hour)

RMS % Error
16.05

RMS % Error

Figure 6.21.3.2.8

TABLE 6.21.3.3

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
Unspecified	S	R.T.	T-S	130	3.5% NaCl	CANT	1	0.125	0.13	---	54	18	---	1967	70931
	P	R.T.	---	---	3.5% NaCl	CANT	---	---	---	---	100	38+	---	1967	70887
1520°F 1hr WQ	P	-51	T-L	124	5 to 1 Solvent to Solute Ratio	DCB	1	0.25	0.25	0.99	95	20	---	1962	83689
		-15	T-L	124	Water LiCl	DCB	1	0.25	0.25	0.99	95	22.7	---	1962	83689
		12	T-L	124	CCl_4	DCB	1	0.25	0.25	0.99	95	19.4	---	1962	83689
		27	T-L	124	Water LiCl	DCB	1	0.25	0.25	0.99	95	20.3	---	1962	83689
		36	T-L	124	Water LiCl	DCB	1	0.25	0.25	0.99	95	17	---	1962	83689
					Water LiCl 0.1M	DCB	1	0.25	0.25	0.99	95	23.1	---	1962	83689
		R.T.	T-L	124	5 to 1 Solvent to Solute Ratio Water LiCl -1000MV	DCB	1	0.25	0.25	0.99	95	23.2	---	1962	83689
					Air	DCB	1	0.25	0.25	0.99	95	36	---	1962	83689
					CCl_4	DCB	1	0.25	0.25	0.99	95	20	---	1962	83689
					Chloroform	DCB	1	0.25	0.25	0.99	95	21	---	1962	83689
					DMSO LiCl	DCB	1	0.25	0.25	0.99	95	19	---	1962	83689
					Glycerine	DCB	1	0.25	0.25	0.99	95	26	---	1962	83689
					Glycerine LiCl	DCB	1	0.25	0.25	0.99	95	19	---	1962	83689
					Hexamethyl-Phosphoric Triamide	DCB	1	0.25	0.25	0.99	95	27.8	---	1962	83689

TABLE 6.21.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
WQ	P	R.T.	T-L	124	Methanol	DCB	1	0.25	0.25	0.99	95	13.8	---	1962	83689
					Methanol LiCL	DCB	1	0.25	0.25	0.99	95	13	---	1962	83689
					Mixed Solvents 5 to 1 Solvent to Solute Ratio Formic Acid	DCB	1	0.25	0.25	0.99	95	25	---	1962	83689
					N n-Dimethyl-Acetemide	DCB	1	0.25	0.25	0.99	95	30.6	---	1962	83689
					Water	DCB	1	0.25	0.25	0.99	95	26	---	1962	83689
					Water 0.1M LiCl	DCB	1	0.25	0.25	0.99	95	24.8	---	1962	83689
					Water 9M LiCl 9M $LiNO_3$	DCB	1	0.25	0.25	0.99	95	23.2	---	1962	83689
					Water HCl 1M $TiCL_3$	DCB	1	0.25	0.25	0.99	95	16.3	---	1962	83689
					Water LiBr	DCB	1	0.25	0.25	0.99	95	19.5	---	1962	83689
					Water LiCl	DCB	1	0.25	0.25	0.99	95	14.7	---	1962	83689
					Water LiCl 0.6M NaCl -500MV	DCB	1	0.25	0.25	0.99	95	20	---	1962	83689
					Water LiCl -1000MV	DCB	1	0.25	0.25	0.99	95	17	---	1962	83689
					Water LiCl -200MV	DCB	1	0.25	0.25	0.99	95	15.5	---	1962	83689

TABLE 6.21.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
WQ (cont'd)	P (cont'd)	R.T. (cont'd)	T-L (cont'd)	124 (cont'd)	Water LiCl - 200MV	DCB	1	0.25	0.25	0.99	95	19.9	---	1962	83689
					Water LiCl +500MV	DCB	1	0.25	0.25	0.99	95	27.7	---	1962	83689
					Water LiCl +2000MV	DCB	1	0.25	0.25	0.99	95	20.8	---	1962	83689
					Water LiCl +20000MV	DCB	1	0.25	0.25	0.99	95	20	---	1962	83689
					Water(1) Glycerine(4) LiCl	DCB	1	0.25	0.25	0.99	95	24.5	---	1962	83689
					Water(2.5) Glycerine (2.5)LiCl	DCB	1	0.25	0.25	0.99	95	18	---	1962	83689
					Water(3.4) DMSO(1.6)LiCl	DCB	1	0.25	0.25	0.99	95	19.5	---	1962	83689
					Water(4) Glycerine(1) LiCl	DCB	1	0.25	0.25	0.99	95	19	---	1962	83689
					Water 3.5% NaCl	DCB	1	0.25	0.25	0.99	95	21.4	---	1962	83689
		122	T-L	124	CCl_4	DCB	1	0.25	0.25	0.99	95	19.5	---	1962	83689
		131	T-L	124	DMSO LiCl	DCB	1	0.25	0.25	0.99	95	25	---	1962	83689
		136	T-L	124	Methanol LiCL	DCB	1	0.25	0.25	0.99	95	13	---	1962	83689
		140	T-L	124	Water LiCl	DCB	1	0.25	0.25	0.99	95	21.8	---	1962	83689
		151	T-L	124	Acetone LiBr	DCB	1	0.25	0.25	0.99	95	30	---	1962	83689

TABLE 6.21.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
WQ (cont'd)	P (cont'd)	151 (cont'd)	T-L (cont'd)	124 (cont'd)	Water Ammonium Chloride	DCB	1	0.25	0.25	0.99	95	26	---	1962	83689
		194	T-L	124	Water 0.1M LiCl	DCB	1	0.25	0.25	0.99	95	30.2	---	1962	83689
		203	T-L	124	Water LiCl -1000MV	DCB	1	0.25	0.25	0.99	95	29	---	1962	83689
					Water LiCl +10000MV	DCB	1	0.25	0.25	0.99	95	21.3	---	1962	83689
					Water LiCl +2000MV	DCB	1	0.25	0.25	0.99	95	23.9	---	1962	83689
					Water LiCl 0MV	DCB	1	0.25	0.25	0.99	95	22.2	---	1962	83689
		205	T-L	124	Glycerine LiCl	DCB	1	0.25	0.25	0.99	95	26	---	1962	83689
					Water	DCB	1	0.25	0.25	0.99	95	42'	---	1962	83689
					Water LiCl	DCB	1	0.25	0.25	0.99	95	20.8	---	1962	83689
		212	T-L	124	Silicone Oil	DCB	1	0.25	0.25	0.99	95	65'	---	1962	83689
		235	T-L	124	Water LiCl	DCB	1	0.25	0.25	0.99	95	22.7	---	1962	83689
		412	T-L	124	Glycerine LiCl	DCB	1	0.25	0.25	0.99	95	26	---	1962	83689
1675°F 1hr AC 1075°F 8hr AC 1000°F 2hr AC	P	R.T.	T-L	138.9	3.5% NaCl	CANT	---	0.866	1	---	---	26.4	---	1981	NR001

TABLE 6.21.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
1700°F 1hr AC 1200°F 2hr WQ	P	R.T.	T-S	107.9	3.5% NaCl	CANT	1	0.5	1	---	112	28	---	1967	70931
1775°F 0.5hr FC to 1200°F 1200°F 0.5hr AC 1200°F 3hr Argon Quench	P	32	T-L	150	Water 21000PPM Chloride	CANT	2	0.25	0.25	0.2	65.4	17.7	---	1973	85855
		R.T.	T-L	150	Water 0.1PPM Chloride	CANT	2	0.25	0.25	0.2	59.5	24.2	---	1973	85855
					Water 100PPM Chloride	CANT	2	0.25	0.25	0.2	58.7	20.8	---	1973	85855
					Water 21000PPM Chloride	CANT	2	0.25	0.25	0.2	67.4	14	---	1973	85855
					Water 6000PPM Chloride	CANT	2	0.25	0.25	0.2	60.3	18.4	---	1973	85855
		140	T-L	150	Water 21000PPM Chloride	CANT	2	0.25	0.25	0.2	62.1	14.7	---	1973	85855
		200	T-L	150	Water 21000PPM Chloride	CANT	2	0.25	0.25	0.2	66.3	18.4	---	1973	85855
1825°F 1hr AC	P	R.T.	T-S	120.4	3.5% NaCl	CANT	1	0.5	1	---	88	23	---	1967	70931
2000°F 0.5hr AC	P	R.T.	T-L	115.1	3.5% NACL	CANT	---	0.866	1	---	---	47.3	---	1981	NR001

TABLE 6.21.3.3 (CONTINUED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen Design	Specimen Width (in)	Specimen Thick (in)	Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
Mill Annealed	P	R.T.	L-S	---	3.5% NaCl	NB	---	---	0.5	---	45	20'	---	1969	75386
			T-S	123	3.5% NaCl	CANT*	1	0.1	1	---	75	46+	---	1967	84327
						CANT*	1	0.25	1	---	75	38	---	1967	84327
						CANT	1	0.25	1	---	75	61+	---	1967	84327
						CANT	1	0.5	1	---	83	41	---	1967	84327
						CANT*	1	0.5	1	---	83	41	---	1967	84327
						CANT*	1	1	1	---	83	38	---	1967	84327
						CANT	1	1	1	---	83	39	---	1967	84327
Mill Annealed 1435°F 8hr FC	S	R.T.	T-S	145	3.5% NaCl	CNT	8	0.16	0.16	0.8	35	21	---	1967	70733
				150	3.5% NaCl	SENT	3	0.125	0.13	---	55.5	22	---	1969	77456
VAC Annealed	P	R.T.	T-L	135	3.5% NaCl	CANT*	1	0.27	---	---	44	23	---	1968	84326
						CANT*	1	0.27	---	---	102	27	---	1968	84326
						CANT*	1	0.27	---	---	65	23	---	1968	84326
					Hexane	CANT*	1	0.27	---	---	65	34	---	1968	84326
						CANT*	1	0.27	---	---	44	34	---	1968	84326
					Methanol	CANT*	1	0.27	---	---	65	23	---	1968	84326
						CANT*	1	0.27	---	---	44	23	---	1968	84326

TABLE 6.21.3.3 (CONCLUDED)

K_{Iscc} SUMMARY FOR TITANIUM ALLOY Ti-8Al-1Mo-1V

Condition/ Heat Treat	Prod Form	Test Temp (°F)	Spec Or.	Yield Str (Ksi)	Envir.	Specimen			Prod Thk (in)	Crack (in)	K_Q (Ksi√in)	K_{Iscc} (Ksi√in)	Test Time (min)	Test Date	Refer
						Design	Width (in)	Thick (in)							
VAC Annealed (cont'd)	P (cont'd)	R.T. (cont'd)	T-L (cont'd)	135 (cont'd)	Methanol (cont'd)	CAN'T+	1	0.27	---	---	102	22	---	1968	84326

+ specimen thickness does not meet minimum requirements of $2.5\left(\frac{K_{Iscc}}{\sigma_{ys}}\right)^2$

* asterisk in specimen design column indicates that specimens are side-grooved

TABLE 6.22.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY Ti-Mo8V2Fe3Al AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	STA REAGED AT 1100F 6HR	54	1.	3	53.9	1.	3	---	---	---

TABLE 6.22.2.1

TITANIUM Ti-8Mo-8V-2Fe-3Al K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
1475F 1.5 HR WQ 1000F 8 HR AC	Extrusion	3.00	R.T.	---	155.0	1.498	0.750	CT	0.766	0.12	34.30	34.9	1.2	1973	87230
		3.00			155.0	1.498	0.750	CT	0.747	0.12	34.10			1973	87230
		3.00			155.0	1.500	0.750	CT	0.776	0.14	36.30			1973	87230
STA REAGED AT 1100F 6 HR	Plate	1.00	R.T.	L-T	170.0	1.989	0.998	CT	1.001	0.26	55.00	54.0	1.0	---	86429
		1.00			170.0	1.990	1.002	CT	0.994	0.24	53.10			---	86429
		1.00			170.0	1.995	1.005	CT	0.995	0.25	53.90			---	86429
STA REAGED AT 1100F 6HR	Plate	1.00	R.T.	T-L	177.0	1.991	0.991	CT	0.987	0.23	53.40	53.9	1.0	---	86429 (1)
		1.00			177.0	1.995	0.998	CT	1.008	0.24	55.00			---	86429 (1)
		1.00			177.0	1.993	0.996	CT	1.014	0.23	53.20			---	86429 (1)

NOTES: (1) COMPOSITION(WT PERCENT) 2.26Al, 7.99V, 8.17Mo, 0.022C, 0.018N, 0.0070H, 0.16O, 0.006Cu
ALPHA PRECIPITATE IN BETA MATRIX
STRAIGHTNESS OF CRACK FRONT MAY NOT MEET ASTM E399-72 REQUIREMENTS

TABLE 6.23.2.1

TITANIUM Ti-5Al-2.5Sn ELI K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	2.5 * $(K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED	Forging	---	-423	---	186.0	2.000	1.005	CT	1.060	0.32	66.60	67.5	4.4	1970	88439
		---			186.0	2.000	1.006	CT	1.040	0.27	61.10			1970	88439
		---			186.0	2.000	1.006	CT	1.010	0.32	66.30			1970	88439
		---			187.0	2.000	1.000	CT	0.950	0.40	74.50			1970	88439
		---			187.0	2.000	1.000	CT	0.930	0.34	69.30			1970	88439
		---			187.0	2.000	1.004	CT	1.020	0.32	67.00			1970	88439
ANNEALED	Forging	17.00	-423	R-L	189.0	2.000	1.000	CT	0.910	0.32	67.90	70.8	2.9	1970	88439
		17.00			189.0	2.000	1.000	CT	0.950	0.39	74.50			1970	88439
		17.00			189.0	2.000	1.000	CT	0.950	0.36	71.50			1970	88439
		17.00			189.0	2.000	1.000	CT	0.930	0.34	69.30			1970	88439
ANNEALED	Forging	17.00	-423	R-C	189.0	2.000	1.000	CT	1.020	0.19	52.40	53.2	3.8	1970	88439
		17.00			189.0	2.000	1.000	CT	1.040	0.17	49.80			1970	88439
		17.00			189.0	2.000	1.000	CT	1.000	0.23	57.30			1970	88439
ANNEALED EQUIAXED STRUCTURE	Forging	---	-423	---	186.0	2.000	1.002	CT	1.010	0.36	70.80	70.3	0.6	1970	88439
		---			186.0	2.000	1.001	CT	1.050	0.35	70.00			1970	88439
		---			186.0	2.000	1.001	CT	1.010	0.35	69.80			1970	88439
		---			186.0	2.000	1.004	CT	1.020	0.36	71.20			1970	88439
		---			186.0	2.000	1.002	CT	1.020	0.35	69.80			1970	88439
		---			186.0	2.000	1.003	CT	1.000	0.35	70.00			1970	88439

TABLE 6.23.2.1 (CONCLUDED)

TITANIUM Ti-5Al-2.5Sn ELI K_{Ic}

CONDITION	PRODUCT FORM	PRODUCT THICK (in.)	TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN WIDTH (in.) W	SPECIMEN THICK (in.) B	SPECIMEN DESIGN	CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic} K_{Ic} (Ksi√in.)	K_{Ic} K_{Ic} MEAN	K_{Ic} STAN DEV	DATE	REFER
ANNEALED INTERMEDIATE STRUCTURE BETWEEN PLATELET ALPHA AND FINE EQUIAXED GRAINS	Forging	---	-423	---	186.0	2.000	1.000	CT	1.010	0.56	88.20	79.2	6.6	1970	88439
		---			186.0	2.000	1.001	CT	1.020	0.50	83.30			1970	88439
		---			186.0	2.000	1.002	CT	1.020	0.37	71.70			1970	88439
		---			186.0	2.000	1.001	CT	0.990	0.41	75.20			1970	88439
		---			186.0	2.000	1.002	CT	1.060	0.44	77.60			1970	88439

TABLE 6.24.1.1

MEAN PLANE STRAIN FRACTURE TOUGHNESS FOR TITANIUM ALLOY Ti-6Al6V2Sn ELI AT ROOM TEMPERATURE

Product Form	Condition/Heat Treatment	K_{Ic} ($ksi\sqrt{in}$)								
		Specimen Orientation								
		L-T			T-L			S-L		
		Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n	Mean K_{Ic}	Std Dev	n
Plate	1600F 1 HR WQ 1050F 4HR AC	29.8	0.5	3	---	---	---	---	---	---
	1650F 1 HR WQ 1050F 4HR AC	34	3.5	2	---	---	---	---	---	---

TABLE 6.24.2.1

TITANIUM Ti-6Al-6V-2Sn ELI K_{Ic}																
CONDITION	PRODUCT		TEST TEMP (°F)	SPEC OR	YIELD STR (Ksi)	SPECIMEN			CRACK LENGTH (in.) A	$2.5 * (K_{Ic}/TYS)^2$ (in.)	K_{Ic}			DATE	REFER
	FORM	THICK (in.)				WIDTH (in.) W	THICK (in.) B	DESIGN			K_{Ic} (Ksi√in.)	K_{Ic} MEAN	STAN DEV		
1600F 1 HR WQ 1050F 4HR AC	Plate	1.00	R.T.	L-S	179.0	0.499	0.250	NB	0.184	0.07	30.10	32.4	2.5	1965	84316
		1.00			179.0	0.499	0.250	NB	0.222	0.08	32.10			1965	84316
		1.00			179.0	0.499	0.251	NB	0.215	0.10	35.10			1965	84316
1600F 1 HR WQ 1050F 4 HR AC	Plate	1.00	R.T.	L-T	179.0	0.499	0.250	NB	0.177	0.07	30.20	29.8	0.5	1965	84316
		1.00			179.0	0.499	0.255	NB	0.200	0.07	30.00			1965	84316
		1.00			179.0	0.499	0.247	NB	0.223	0.07	29.20			1965	84316
1650F 1 HR WQ 1125F 4 HR AC	Plate	1.00	-320	L-S	258.0	0.499	0.250	NB	0.206	0.02	22.60	23.7	1.5	1965	84316
		1.00			258.0	0.499	0.250	NB	0.221	0.02	24.70			1965	84316
1650F 1 HR WQ 1125F 4 HR AC	Plate	1.00	R.T.	L-S	170.0	0.499	0.250	NB	0.191	0.12	37.50	38.1	0.8	1965	84316
		1.00			170.0	0.499	0.250	NB	0.205	0.13	38.60			1965	84316
1650F 1 HR WQ 1125F 4 HR AC	Plate	1.00	R.T.	L-T	170.0	0.499	0.251	NB	0.219	0.11	36.50	34.0	3.5	1965	84316
		1.00			170.0	0.499	0.248	NB	0.191	0.09	31.50			1965	84316

TABLE 6.25

REFERENCES FOR THE TITANIUM ALLOY DATA

54304 Ti-6Al-4V K_c

Figge, I. E., "Residual Static Strength of Several Titanium and Stainless Steel Alloys and One Superalloy at - 109 F, 70 F, and 550F," NASA TN D-2045, Langley Research Center (December 1963).

57573 Ti-6Al-4V K_c

Anon., "Fracture Toughness and Tear Tests," Air Force Materials Laboratory, Research and Technology Division, Report No. ML-TDR-64-238, October 1964.

58782 Ti-6Al-4V K_c

Anon., "Thick Section Fracture Toughness," ML-TDR-64-236, Boeing-North American (October 1964).

60578 Ti-6Al-4V ELI K_c

Christian, J. L., Yang, C. T., and Witzell, W. E., "Physical and Mechanical Properties of Pressure Vessel Materials for Application in a Cryogenic Environment," ASD-TDR-62-258, Part III, General Dynamics/Astronautics (December 1964).

66103 Ti-5Al-2.5Sn K_c

Ferguson, C. W., "Hypervelocity Impact Effects on Liquid Hydrogen Tanks," NASA CR-54852, Douglas Aircraft Co., Inc. (March 1966).

66218 Ti-5Al-2.5Sn K_c

Tiffany, C. F., Lorenz, P. M., and Hall, L. R., "Investigation of Plane-Strain Flaw Growth in Thick-Walled Tanks," NASA CR-54837, The Boeing Company, (February 1966).

67821 Ti-8Al-1Mo-1V K_c

Walker, E. K., "A Study of the Influence of Geometry on the Strength of Fatigue Cracked Panels," AFFDL-TR-66-92, Northrop Norair (June 1966).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

68968 Ti-5Al-2.5Sn K_c

Sullivan, T. L., "Uniaxial and Biaxial Fracture Toughness of Extra-Low-Interstitial 5Al-2.5Sn Titanium Alloy Sheet at 20 K," NASA TN D-4016, Lewis Research Center, (June 1967).

70733 Ti-8Al-1Mo-1V K_{Iscc}

Smith, H. R., et al., "A Study of Stress Corrosion Cracking by Wedge-Force Loading," Report D6-19768, The Boeing Company, Renton, Wash., Contract N00014-66-C-0365, (June 1967).

70887 Ti-6Al-4V K_{Iscc}
Ti-6Al-6V-2.5Sn K_{Iscc}
Ti-8Al-1Mo-1V K_{Iscc}

Peterson, M. H., Brown, B. F., Newbegin, R. L., and Groover, R. E., "Stress Corrosion Cracking of High Strength Steels and Titanium Alloys in Chloride Solutions at Ambient Temperature," Corrosion, 23 (5), 142-148 (May 1967).

70931 Ti-6Al-4V K_{Iscc}
Ti-6Al-4V ELI K_{Iscc}
Ti-6Al-6V-2.5Sn K_{Iscc}
Ti-8Al-1Mo-1V K_{Iscc}

Judy, Jr., R. W., and Goode, R. J., "Stress-Corrosion Cracking Characteristics of Alloys of Titanium in Salt Water," Interim Report 6564, Naval Research Laboratory, Washington, D. C., Contracts NONR-610(09), NONR-760(31) and N00014-66-C0365 (July 21, 1967).

71709 Ti-8Al-1Mo-1V K_c

Figge, I. E., "Residual-Static-Strength and Slow-Crack-Growth Behavior of Duplex-Annealed Ti-8Al-1Mo-1V Sheet," NASA TN D-4358, Langley Research Center, (March 1968).

74355 Ti-6Al-4V K_{Iscc}

Stanley, J. K., "Solutions to Some Stress Corrosion Cracking Problems in Aerospace Applications," Technical Report TR-0200 (4112.22)-1, Aerospace Corporation, El Segundo, Calif., Contract F04701-68-C-0200 (November 1968).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

75386 Ti-4Al-3Mo-1V K_{Iscc}
Ti-6Al-4V K_{Iscc}
Ti-8Al-1Mo-1V K_{Iscc}

Curtis, R. E., et al., "Relationship Between Composition, Micro-structure, and Stress Corrosion Cracking (In Salt Solution) In Titanium Alloys," ASM Transactions Quarterly, 62 (2), 457-469 (June 1969).

75528 Ti-6Al-4V K_{Iscc}

Bixler, W. D., "Fracture Characteristics of 6Al-4V Titanium Alloy Forgings Containing Alpha Stringer Microstructure," NASA Final Report CR-99512, The Boeing Company, Seattle, Wash., Contract NAS-9-8809 (January 1969).

76411 Ti-6Al-4V K_{Ic}

Wessel, E. T., et al., "Engineering Methods for the Design and Selection of Materials Against Fracture," Final Technical Report, Westinghouse Research Laboratories, Pittsburgh, PA., Contract DA-30-069-AMC-602 (T) (June 24, 1966).

77290 Ti-6Al-4V K_{Iscc}

Reuter, W. G., et al., "Monitoring of Crack Growth on Ti-6Al-4V Alloy by the Stress Wave Analysis Technique," NASA Report CR-101888, Aerojet General Corporation, Sacramento, Calif. (December 1968).

77456 BETA K_{Iscc}
BETA Ti da/dt
Ti-8Al-1Mo-1V da/dt; K_{Iscc}

Katz, Y., "Micro-Mechanical Approach to Stress Corrosion Cracking in Titanium Alloys," Thesis Report No. UCRL-19046, University of California, Lawrence Radiation Laboratory, Berkeley, Calif., AEC Contract W-7405-eng-48 (September 1969).

78535 Ti-6Al-4V K_{Iscc}

Masters, J. N., et al., "Fracture and Nitrogen Tetroxide/Sustained Load Flaw Growth in 6Al-4V Titanium," Final Report D2-121397-1, NASA CR-109366, The Boeing Company, Seattle, Wash., Contract NAS7-100 (October 1969).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

80104 Ti-5Al-2.5Sn K_c

Orange, T. W., Sullivan, T. L., and Calfo, F. D., "Fracture of Thin Sections Containing Through and Part-Through Cracks," NASA TN D-6305, Lewis Research Center (April 1971).

80538 Ti-6Al-4V K_{Ic}

Petrak, G. J., "Mechanical Property Evaluation of Beta Forged Ti-6Al-4V," Report AFML-TR-70-291, University of Dayton Research Institute, Dayton, Ohio, Contract F33615-69-C-1471 (January 1971).

81221 Ti-6Al-4V da/dt; K_{Iscc}

Beck, T. R., et al., "Stress Corrosion Cracking of Titanium Alloys: Studies of Cracks in Thin Specimens; SCC of Ti-6Al-4V in Chloride, Iodide and Fluoride Solutions; Stress Corrosion Cracking in Molten Salts; Electrochemistry of Freshly Generated Titanium Surfaces," Report 20, The Boeing Company, Seattle, Wash., Contract NAS 7-489, (June 1971).

81741 Ti-8Al-1Mo-1V da/dt

Bucci, R. J., and Paris, P. C., "Observations on Sustained Load Environmental Crack Growth of Titanium 8Al-1Mo-1V Alloy," Corrosion, 27 (12) 525-530 (December 1971).

82651 BETA K_{Iscc}
BETA III da/dt; K_{Iscc}
Ti-8Al-1Mo-1V da/dt

Beck, T. R., and Blackburn, M. J., "Stress Corrosion Cracking of Titanium Alloys; SCC Velocity; Concentration of $TiCl_3$," Report 18, The Boeing Company, Seattle, Wash., Contract NAS 7-489 (December 1970).

83222 Ti-6Al-6V-2Sn K_{Ic}

Amateau, M. F., et al., "F-15 Program Final Report Ti-6Al-6V-2Sn and Ti-6Al-4V Fatigue Crack Propagation," Report No. ATR-72(9990)-3, The Aerospace Corporation, El Segundo, Calif. (September 29, 1971).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

83689 Ti-8Al-1Mo-1V da/dt; K_{Iscc}

Beck, T. R., et al., "Fundamental Investigation of Stress Corrosion Cracking," Report D180-15006-1, The Boeing Company, Aerospace Group, Seattle, Washington, Contract NASW-2245 (April 1962).

83984 Ti-6Al-4V K_c

Feddersen, C. E, and Hyler, W. S., "Fracture and Fatigue-Crack-Propagation Characteristics of 1/4-Inch Mill-Annealed Ti-6Al-4V Titanium Alloy Plate," Report G-9706, Battelle, Columbus Laboratories, Columbus, Ohio, Contract N00156-70-C-1336 (November 1, 1971).

84036 Ti-6Al-4V K_{Iscc}

Beachem, C. D., and Meyn, D. A., "The Effect of Thickness Upon Sustained Load Crack Propagation in Ti-6Al-4V Alloy Tested in 3.5% NaCl Solution," NRL Report 7449, Naval Research Laboratory, Washington, D. C. (August 8, 1972).

84282 Ti-6Al-4V K_{Iscc}

Spurr, W. F., "SST Technology Follow-On Program, Phase I, Titanium Alloy 6Al-4V Extrusion," Report No. FAA-SS-72-06, Boeing Report D6-60206, The Boeing Company, Commercial Airplane Group, Seattle, Wash., Contract No. DOT-FA-SS-71-12, (July 1972).

84290 Ti-8Al-1Mo-1V da/dt

Smith, H. R., Piper, D. E., and Downey, F. K., "A Study of Stress-Corrosion Cracking by Wedge Force Loading," Engineering Fracture Mechanics, 1, p 123-128 (1968), Pergamon Press.

84306 Ti-6Al-4V K_{Ic}

Harrigan, M. J., "B-1 Fracture Mechanics Data for Air Force Handbook Usage," Report TFD-72-501, North American Rockwell, Los Angeles Division, Los Angeles, CA (April 21, 1972).

84316 Ti-6Al-6V-2Sn K_{Ic}
Ti6Al6V2Sn ELI K_{Ic}

DeSisto, T. S., and Hickey, Jr., C. F., "Low-Temperature Mechanical Properties and Fracture Toughness of Ti-6Al-6V-2Sn," ASTM Proceedings, 65, 641-653 (1965).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

84326 Ti-8Al-1Mo-1V K_{Iscc}

Report of NRL Progress, Naval Research Laboratory, Washington, D. C., (May 1968).

84327 Ti-8Al-1Mo-1V K_{Iscc}

Report of NRL Progress, Naval Research Laboratory, Washington, D. C., (May 1967).

84328 Ti-6Al-4V K_{Iscc}

Report of NRL Progress, Naval Research Laboratory, Washington, D. C., (November 1968).

84360 Ti-6Al-4V K_{Ic}; da/dN; da/dt; K_{Iscc}
Ti-6Al-6V-2.5Sn K_{Iscc}
Ti-6Al-6V-2Sn K_{Ic}; da/dN; da/dt

McDonnell Aircraft Company, McDonnell Douglas Corp., St. Louis, Mo., Phase B Test Program, Report MDC A0913 (May 18, 1971).

85034 Ti-6Al-4V K_{Ic}

Mitchell, John, "Laboratory Reports on Fracture Toughness Tests," per memo from Ed Cawthorne of February 5, 1973; data sheets from Schultz Steel Co., South Gate, CA.

85064 Ti-6Al-4V K_{Ic}

Bjeletich, J. G., "Development of Engineering Data on Thick-Section Electron-Beam-Welded Titanium," Report N-LJ-71-18, Lockheed Aircraft Corporation, Lockheed Palo Alto Research Laboratory, Palo Alto, Calif., Contract F33615-71-C-1338, (October 12, 1972).

85634 Ti-6Al-4V K_{Ic}

"Fracture Toughness and Tensile Properties Data for Ti-6Al-4V Forgings," Schultz Steel Company, South Gate, Calif., Attached to memo from Ed Cawthorne dated March 5, 1973.

85836 Ti-6Al-4V K_{Ic}

"B-1 Fracture Toughness Data (K_{Ic}) - Rockwell International," Rockwell International Corporation, Los Angeles, CA (April 24, 1973).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

85837 Ti-6Al-4V a-vs-N; da/dN

"Fracture Toughness Data Collection, Rockwell International Corporation, from B-1 Program," Rockwell International Corporation, Los Angeles, CA., April 1973.

85855 Ti-8Al-1Mo-1V da/dt; K_{Iscc}

Boyd, J. D., "Stress-Corrosion Cracking of Ti-8Al-1Mo-1V in Aqueous Environments: 1. The Kinetics of Subcritical Crack Propagation," Metallurgical Transactions, 4 (4) 1029-1035 (April 1973).

85857 Ti-6Al-4V K_{Ic}

"Shultz Steel Company - Fracture Toughness Data - May 10, 1973," per memo from Ed Cawthorne of May 10, 1973.

86099 Ti-8Al-1Mo-1V a-vs-N; da/dN

Wanhill, R. J. H., "A Review and Analysis of Fatigue Crack Propagation in Titanium Alloys at Room Temperature," Report No. NRL-TR-71035U, National Aerospace Laboratory, The Netherlands (February 1971).

86429 Ti-Mo8V2Fe3Al K_{Ic}

"Fracture Toughness Data," Progress Report on Materials Test Program, General Dynamics Corporation, Fort Worth Division, Fort Worth, Texas, Contract F33615-72-C-2149 (Received July 6, 1973).

86494 Ti-6Al-6V-2Sn K_{Ic}

Harmsworth, C. L., "Evaluation Report - Fracture Toughness Evaluation of Isothermally Forged Ti-6Al-6V-2Sn STA," Report MXE 72-64, Air Force Materials Laboratory, WPAFB, Ohio (November 15, 1972).

86575 Ti-6Al-4V a-vs-N; da/dN

"Rockwell International, B-1 Program, da/dN Data, Center-Cracked Tension Specimens," Lockheed California Company, Burbank, CA, Report LR25152 (Received July 1973) (Memo from Ed Cawthorne dated July 10, 1973).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

86688 Ti-6Al-4V K_{Ic}; K_{Iscc}

Sprowls, D. O., et al., "Evaluation of Stress Corrosion Cracking Susceptibility Using Fracture Mechanics Techniques," Final Report Part I, Aluminum Co. of America, Alcoa Technical Center, Alcoa, Pa., Contract NASA-21487, May 31, 1973.

86844 Ti-6-2-2-2-2 a-vs-N; da/dN
Ti-6Al-6V-2Sn a-vs-N; da/dN

"Crack Growth Rate Data Generated Under USAF Contract F33615-72-C-2165," Lockheed Aircraft Corporation, Lockheed-Georgia Company, Marietta, GA, Contract F33615-72-C-2165, Data Sheets received from AFFDL August 13, 1973.

87230 BETA III K_{Ic}
Ti-6Al-6V-2Sn K_{Ic}
Ti-Mo8V2Fe3Al K_{Ic}

DeSisto, T. S., "Fracture Toughness Measurements of Three Titanium Alloy Extrusions," Report AMMRC-TR-73-31, Army Materials and Mechanics Research Center, Watertown, MA (July 1973).

88140 Ti-6Al-4V da/dN
Ti-6Al-4V ELI da/dN

Hall, L. R., Finger, R. W., and Spurr, W. F., "Corrosion Fatigue Crack Growth in Aircraft Structural Materials," Report AFML-TR-73-204, Boeing Aerospace Company, Seattle, WA. Contract AF33615-71-C-1687 (September 1973).

88144 BETA III K_{Ic}; da/dN
Ti-6Al-4V K_{Ic}; da/dN; da/dt

Bjeletich, J. G., "Development of Engineering Data in Thick-Section Electron Beam Welded Titanium," Report AFML-TR-73-197, Lockheed Missiles and Space Company, Inc., Palo Alto, CA, Contract F33615-71-C-1338 (August 1973).

88186 TI-* K_{Ic}
Ti-6Al-6V-2Sn K_{Ic}

"Selected Pages from Materials Section of Final Report on Cargo/Tanker Phase IA (AFFDL-TR-73-51) Lockheed Report SMN 378," Summary Report, Lockheed-Georgia Company, Marietta, GA, Contract F33615-72-C-2165 (February 8, 1974).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

88439 Ti5Al2.5Sn ELI K_{Ic}

Reuter, W. G., "Fracture Toughness of Ti-5Al-2.5Sn ELI Forgings at -423 F," Summary Report, Aerojet-General Corporation, Sacramento, CA (September 9, 1970).

88440 Ti-6Al-4V K_{Ic}

"Titanium-6Al-4V Fracture Toughness and Tensile Test Data of December 19, 1973," Memo E. W. Cawthorne with fracture toughness data from Schultz Steel Company (December 19, 1973).

88468 Ti-6Al-4V a-vs-N; da/dN

Bell, P. D., "Data Sheets for Constant Amplitude Crack Growth Data Generated by Grumman Aerospace Corporation for 2219-T851 Aluminum and Mill Annealed 6Al-4V Titanium Alloy Plate," letter to J. E. Campbell from Grumman Aerospace Corporation, Bethpage, NY, Contract F33615-72-C-1744 (March 15, 1974).

88575 BETA C K_{Ic}; a-vs-N; da/dN
Ti-6Al-4V K_{Ic}; a-vs-N; da/dN

"Advanced Metallic Air Vehicle Structure Program," Material Property Data Test Report Phase II, Report FZM-6148A, General Dynamics, Convair Aerospace Division, Fort Worth, TX, Contract AF33615-73-C-3001 (January 1974).

88579 Ti-6Al-4V a-vs-N; da/dN

"B-1 Program da/dN Data for Aluminum Alloys," Rockwell International Corporation, memorandum to H. D. Moran from E. W. Cawthorne, Battelle's Columbus Laboratories (April 3, 1974).

88700 Ti-6Al-4V K_{Iscc}

Gilbreath, W. P., and Adamson, M. J., "The Stress Corrosion Susceptibility of Several Alloys in Hydrazine Fuels," NASA Technical Note, Report NASA TN D-7604, Ames Research Center, Moffett Field, CA (February 1974).

88911 Ti-5Al-2.5Sn a-vs-N; da/dN

Wanhill, R. J. H., et al., "Fatigue Crack Propagation Data for Titanium Sheet Alloys - Interim Report No. 3:Ti-5Al-2.5Sn," Report NLR TR 72093 U, National Aerospace Laboratory, the Netherlands (July 1972).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

88962 Ti-6Al-4V K_{Ic}
Ti-6Al-6V-2Sn K_{Ic}
Ti-6Al2Sn4Zr6Mo K_{Ic}

Sparks, R. B., and Long, J. R., "Improvement Manufacturing Methods for Producing High Integrity More Reliable Titanium Forgings," Report AFML-TR-73-301, Wyman-Gordon Company, Worchester, MA, Contract AF33615-71-C-1560 (February 1974).

89004 Ti-6Al-4V K_{Ic}; K_{Iscc}

"Rockwell International, B-1 Program Titanium K_{ic}, K_c, and K_{iscc} Data for HB-01 Revision," with data attached to memorandum from E. W. Cawthorne to H. D. Moran (May 1, 1974).

89504 Ti-6Al-4V K_{Ic}

Cervay, R. R., "Mechanical Properties of Ti-6Al-4V Annealed Forgings," Report AFML-TR-74-49, University of Dayton Research Institute, Dayton, OH, Contract F33615-72-C-1282 (March 1974).

90012 Ti-6Al-4V K_{Ic}

"Ti-6Al-4V Fracture Toughness Data - Shultz Steel Company, South Gate, CA, of August 8, 1974," with memorandum from E. W. Cawthorne to H. D. Moran of Battelle's Columbus Laboratories (August 8, 1974).

90584 Ti-6Al-4V K_{Ic}
Ti-6Al-6V-2Sn K_{Ic}

DeMay, S., "Improved Fracture Toughness of Titanium," Final Report, Grumman Aerospace Corporation, Bethpage, NY, Contract N62269-73-C-0127 (June 1973) (AD 778 652).

90589 Ti-6Al-6V-2Sn K_{Ic}

Fiftal, C. F., and Beck, E. J., "Development of Fracture Mechanics Data for 6Al-6V-2Sn Titanium Alloy," Report MCR-74-43, Martin Marietta Corp., Denver Division, Denver, CO, Contract NAS 9-13599 (January 1974).

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

90981 Ti-6Al-4V a-vs-N; da/dN
Ti-6Al-6V-2Sn K_{Ic}; a-vs-N; da/dN

Krupp, W. E., Wimmer, F. T., Pettit, D. E., and Hoeppner, D. W., Data Sheets for Final Report on "Investigation of the Effects of Stress and Chemical Environments on the Prediction of Fracture in Aircraft Structural Materials," Rye Canyon Research Laboratory, Lockheed-California Company, Burbank, CA, Contract F33615-71-C-1688, data sheets received October 21, 1974.

91332 Ti-6Al-4V da/dN

Wells, R. R., "New Alloys for Advanced Metallic Fighter-Wing Structures," Northrop Corporation, Aircraft Division, Hawthorne, CA, AIAA/ASME/SAE 15th Structures, Structural Dynamics and Materials Conference, Las Vegas, NV (April 17-19, 1974).

91793 BETA III K_{Ic}

Van Stone, R. H., Low, J. R. Jr., and Shannon, J. L., Jr., "The Effect of Microstructure on the Fracture Toughness of Titanium Alloys," NASA Technical Report No. 2-Ti, Carnegie-Mellon University, Pittsburgh, Pa., and NASA, Lewis Research Center, Cleveland, Ohio, Research Grant NGR 39-087-047 (December 1974).

91945 Ti-6Al-6V-2Sn da/dN

Kondas, K. R., et al., "Cyclic-Crack-Growth and Fracture Resistance of Ti-6Al-6V-2Sn as Influenced by Recrystallization Anneal and Interstitial Oxygen Content," NRL Report 7844, Naval Research Laboratory, Washington, D. C. (January 8, 1975).

GD007 Ti-6Al-4V a-vs-N; da/dN

Margolis, W. S., "F-16 Material Allowables Evaluating Beta Annealed 6Al-4V Titanium Alloy," General Dynamics, Fort Worth Division, Report No. 16PR944, September 1978.

GE006 Ti-8Al-1Mo-1V da/dN

"Fatigue Crack Growth Rate Data on Titanium Ti-8-1-1 Alloy Using K_b Bar Specimens from the TF34 DTA Effort". Data Sent from M. S. Gilbert, General Electric Co., Evendale, Ohio, October 1982.

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

GE007 Ti-6Al-4V da/dN

"Fatigue Crack Growth Rate Data on Titanium Ti-6-4 Alloy Using Kb Bar Specimens from the TF34 DTA Effort," Data sent from M. S. Gilbert, General Electric Co., Evendale, Ohio, October 1982.

JEM01 Ti-6Al-4V K_{Ic}
Ti-6Al-6V-2Sn K_{Ic}

Yoder, G. R., Cooley, L. A., and Crooker, T. W., "Enhancement of Fatigue Crack Growth and Fracture Resistance in Ti-6Al-4V and Ti-6Al-6V-2Sn Through Micro-Structural Modification," Journal of Engineering Materials and Technology, Vol. 99, pp. 315-318, October 1977.

MA002 Ti-6Al-4V K_{Ic}; a-vs-N; da/dN
Ti-6Al-6V-2Sn a-vs-N; da/dN

Fracture Toughness of Ti-6Al-4V Plate and Forging, Aluminum 2124-T851 Plate and 7175-T37652 Forging and Fatigue Crack Growth Rate for Ti-6Al-4V Plate and Forging, Ti-6Al-6V-2Sn Extrusion, Aluminum 2124-T851 Plate and Aluminum 7175-T73652 Forging, Data Submitted by D. L. Rich of McDonnell Aircraft Co., St. Louis, MO, Attachment #2, Received March 12, 1982.

MA003 Ti-6Al-4V K_{Ic}; a-vs-N; da/dN

Seay, S., and Krieg, J. F., "Wing Carry Through Lug Joint Crack Growth Tests," McDonnell Aircraft Co., St. Louis, MO, Report MDC A3449, Attachment #3, Submitted by D. L. Rich, March 12, 1982.

MA005 Ti-6Al-4V da/dN; K_{Iscc}

Garland, K., and Krieg, J. F., "Final Report - Basic Fracture Data for F-18 Material," McDonnell Aircraft Company, St. Louis, MO, Report No. 3 NA-66-7KW, Attachment #5, March 1977.

MA006 Ti-6Al-4V da/dN

Garland, K., and Krieg, J. F., "Evaluation of the Effect of Material Cyclic Softening and Hardening on Crack Initiation Life and Crack Growth, with and without Overloads as a Function of Stress Ratio," McDonnell Aircraft Company, St. Louis, MO, April 1978.

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

MA011 Ti-8Al-1Mo-1V da/dN

"Final Report, F/RF-4C/D Damage Tolerance and Life Assessment Study - Vol. II," McDonnell Aircraft Company, St. Louis, MO, Contract No. AFSC F33657-73-A-0062, Report No. MDC A2883, February 1975.

NC001 Ti-6Al-4V K_{Ic}
Ti-6Al-4V ELI K_{Ic}

"Plane Strain Fracture Toughness Data Sets on Aluminum, Steel, and Titanium Alloys," Data sent from P. G. Porter of Northrop Corp., Hawthorne, CA, March 1, 1982.

NC002 Ti-6Al-4V a-vs-N; da/dN
Ti-6Al-4V ELI a-vs-N; da/dN

"Fatigue Crack Growth Rate Data on Aluminum, Steel, and Titanium Alloy," Data sent from P. G. Porter, Northrop Corp., Hawthorne, CA, March 1, 1982.

NL001 Ti-6Al-4V a-vs-N; da/dN

Data Sheets on Ti-6Al-4V - Fatigue Crack Growth Rate Tests - submitted by W. S. Johnson, NASA Langley Research Center, Hampton, VA, March 1982.

NR001 Ti-6Al-4V K_{Ic}
Ti-8Al-1Mo-1V K_{Iscc}

Yoder, G. R., Cooley, L. A., and Crooker, T. W., "Effects of Microstructure and Frequency on Corrosion-Fatigue Crack Growth in Ti-8Al-1Mo-1V and Ti-6Al-4V," Naval Research Laboratory, Washington, D. C., Report 4678, December 1981.

PW002 Ti-6-2-4-2 da/dN
Ti-6-2-4-6 da/dN
Ti-8Al-1Mo-1V K_{Ic}; da/dN

Beyer, J. R., Sims, D. L., and Wallace, R. M., "Titanium Damage Tolerant Design Data for Propulsion Systems," United Technologies Corp., Pratt and Whitney Aircraft Group, West Palm Beach, FL, Report AFML-TR-77-101, Contract No. F33615-75-C-5130, June 1977.

TABLE 6.25 (CONTINUED)

REFERENCES FOR THE TITANIUM ALLOY DATA

PW003 Ti-6Al-4V da/dN

Fatigue Crack Growth Rate Data on Titanium and Nickel Base Alloy from B. S. Schwartz, Pratt and Whitney Aircraft Group, Government Products Division, West Palm Beach, FL, July 1982.

RI005 CORONA 5 K_{Ic}
Ti-6Al-4V K_{Ic}
Ti-6Al2Sn4Zr6Mo K_{Ic}

Chesnutt, J. C., et al., "Fatigue Crack Propagation and Fracture of Titanium Alloys," Rockwell International Science Center, Thousand Oaks, CA, and Department of Metallurgy and Material Science, Carnegie-Mellon University, Pittsburgh, PA.

RI006 Ti-6Al-4V K_{Iscc}

Ferguson, R. R., and Berryman, R. C., "Fracture Mechanics Evaluation of B-1 Materials," Rockwell International, B-1 Division, Los Angeles, CA, Contract No. F33657-70-C-0800, Report No. AFML-TR-76-137, October 1976.

SA001 Ti-6Al-4V a-vs-N; da/dN

Rungta, R., Deel, O., and Frey, N., "Fatigue-Crack-Propagation Behavior of Materials of Several H-53 Helicopter Materials," Sikorsky Aircraft Company, Stratford, CT, Data Submitted by Battelle, Columbus, OH, 43201, Received October 20, 1992.

UD001 Ti-6-2-4-6 da/dN

Cervay, R. R., "Ti-6-2-4-6 Elevated Temperature Modeling of Fatigue Crack Growth Rate Data," University of Dayton Research Institute, Dayton, Ohio, Contract No. F33615-80-C-5011 Technical Memorandum UDR-TM-81-48, December 1981.

UD008 Ti-6Al-4V K_{Ic}; da/dN

Cervay, R. R., "Beta Processed Titanium 6Al-4V Fracture Properties," University of Dayton Research Institute, Dayton, Ohio, Contract No. F33615-74-C-5024, Technical Memorandum UDRI-TM-75-08, July 1975.

TABLE 6.25 (CONCLUDED)

REFERENCES FOR THE TITANIUM ALLOY DATA

UM001 Ti-6Al-4V da/dN

Wilson, D. A., "A Statistically Based Investigation of Microstructural Effect on the Fatigue Properties of Titanium and Titanium Alloys," Dissertation to University of Missouri, in Partial Fulfillment of PhD Requirement, December 1978.