

Annex L

Reference Sources for Material Property Data

L Reference Sources for Materials Properties Data

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L.1 Introduction

Annex L provides an informative reference source for material property input data for fracture, fatigue, creep and corrosion (environmental cracking) assessment procedures. Property data for both defect-free and defect assessment are considered. In the absence of specific guidance on mean, lower-bound or upper-bound data parameters, assessors will have to determine the appropriate values for their application from an evaluation of available information from referenced and own data sources, or use of the estimation approaches given in sect. 4.5. Reviews of material property data sources are given for fracture assessment in **Error! Reference source not found.** (Section L.2), for fatigue assessment in **Error! Reference source not found.** (Sect. L.3), for creep assessment in Table L 3 (Sect. L.4), and for corrosion (and environmental cracking) assessment in Table L 5 (Sect. L.5).

The best reference sources for minimum tensile (and impact) property requirements and for mean creep rupture strength requirements for specific steel/alloy grades are the relevant product standards (e.g. [L.1-L.4]). The recommended source of physical properties is a recognised Standard (e.g. [L.5]), although general compilations (e.g. [L.6,L.7]) and alloy producer data sheets (e.g. [L.8]) may also be consulted.

L.2 Material Properties for Fracture Assessment

Sources of material property data for fracture assessment are given in **Error! Reference source not found.** Specific properties for Ti-base and Al-base alloys from [L.6] are respectively given. The material properties needed for;

General

@Elastic and physical properties

- E (E_S and/or E_D), n , a • As a function of temperature – RT to $T_{app,max}$?

@Tensile properties

- R_e and/or $R_{p0.2}$ and R_m
- Ramberg-Osgood constants, single ramp loading n and A
- As a function of temperature – RT to $T_{app,max}$?

Fracture**@Fracture toughness**

- K_{Ic} , K_{Jc} , CTOD

@Charpy

- CVN(T), FATT50, USE

Table L 1 Fracture assessment material property data source

MATERIAL		TEMP °C	REFERENCE(S) FOR SOURCE(S) OF INDICATED MATERIAL PROPERTY DATA					
DESIGNATION	CONDITION		DEFECT-FREE ASSESS		DEFECT ASSESSMENT			
			$R_{p0.2}, R_M$	$\delta(\sigma)$	$Cv(T)$	K_{Ic}	$J_c, J(\Delta a)$	$\delta_c, \delta(\Delta a)$
C-Mn STEELS								
Various	see source reference(s)	various	L.1b,L.3,L.6,L.7, L.9	L.7,L.10		L.6,L.7,L.9, L.11a-d	L.9	
LOW ALLOY FERRITIC STEELS								
Various	see source reference(s)	various	L.1b,c,L.2b,c, L.3,L.6,L.7,L.9	L.7,L.10		L.6,L.7,L.9, L.11a-d	L.9	
5-12Cr MARTENSITIC STEELS								
Various	see source reference(s)	various	L.1c,L.2b,e, L.3,L.6,L.7,L.9	L.7,L.10		L.6,L.7,L.9, L.11a-d		
CrNi AUSTENITIC STEELS								
Various	see source reference(s)	various	L.1d,L.2e, L.3,L.6,L.7,L.9	L.7,L.10		L.6,L.7,L.9, L.11a-d	L.9	
NiCr AUSTENITIC STEELS								
Various	see source reference(s)	various	L.2e,L.3,L.6, L.7,L.9	L.7,L.10		L.6,L.7,L.9, L.11a-d		
Ni-BASE ALLOYS								
Various	see source reference(s)	various	L.4,L.6,L.7,L.8	L.4,L.7	L.8	L.6,L.7,L.11a-d		
Ti-BASE ALLOYS								
Various	see source reference(s)	various	L.6	L.7,L.10		L.6,L.7,L.11a-d		
Al-BASE ALLOYS								
Various	see source reference(s)	various	L.4,L.6	L.7,L.10		L.6,L.7,L.11a-d		

L.3 Material Properties For Fatigue Assessment

Sources of material property data for fatigue assessment are given in **Error! Reference source not found.**

For fatigue assessment of non-welded structures, the recommended fatigue crack growth formulation is the NASGRO equation (sect. 7.1), and parameters are given for a range of steels in [].

Fatigue

@S-N

- HCF – $\sigma_o(\sigma_m, R, T)$

- LCF – constants for $\Delta\varepsilon(N, f, T)$

- Ramberg-Osgood constants, cyclic $n(N, f, T)$ and $A'(N, f, T)$ @**Fatigue Crack Growth (FCG)**

- $\Delta K_{TH}(R, f, T)$, Paris constants ($A(R, f, T)$ and $m(R, f, T)$), Nasgro constants

©CFCG

- Considered in Corrosion section

@Welds

Table L 2 Fatigue assessment material property data source

MATERIAL		TEMP °C	REFERENCE(S) FOR SOURCE(S) OF INDICATED MATERIAL PROPERTY DATA				
DESIGNATION	CONDITION		DEFECT-FREE ASSESSMENT			DEFECT ASSESSMENT	
			$\sigma_{a,0}$	$\Delta\epsilon(\Delta\sigma)$	$S-N, N(\epsilon)$	$\Delta K_I(a)$	$da/dN(\Delta K_I, a)$
C-Mn STEELS							
Various	see source reference(s)	various	L.6,L.13	L.14A,L.15A,L.16	L.14A,L.15A,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
LOW ALLOY FERRITIC STEELS							
Various	see source reference(s)	various	L.6,L.13	L.14B,L.15B,L.16	L.14B,L.15B,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
5-12Cr MARTENSITIC STEELS							
Various	see source reference(s)	various	L.6,L.13	L.14C,L.15C,L.16	L.14C,L.15C,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
CrNi AUSTENITIC STEELS							
Various	see source reference(s)	various	L.6,L.13	L.14C,L.15C,L.16	L.14C,L.15C,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
NiCr AUSTENITIC STEELS							
Various	see source reference(s)	various	L.6,L.13	L.14C,L.15C,L.16	L.14C,L.15C,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
Ni-BASE ALLOYS							
Various	see source reference(s)	various	L.6,L.8,L.13	L.16	L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
Ti-BASE ALLOYS							
Various	see source reference(s)	various	L.6,L.13	L.14D, L.15D, L.16	L.14D,L.15D,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17
Al-BASE ALLOYS							
Various	see source reference(s)	various	L.6,L.13	L.14D,L.15D,L.16	L.14D,L.15D,L.16	L.12,L.17	L.7,L.10,L.11a-d, L.12,L.17

L.4 Material Properties For Creep Assessment

Sources of material property data for creep assessment are given in Table L 4. Typical constants for deriving creep crack growth rate using:

$$\dot{a} = A \cdot (C^*)^q$$

are given in Table L 4.

Creep

© Creep-rupture

- $Rf0.2/tT, R_u/tT$ and $\Delta\varepsilon(t, T, \sigma)$, inc. isochronous curves

© CCI

- Constants for $t_i(C^*, T)$

© CCG

- Constants for $da/dt(C^*, T)$

© CF

- Constants for $\Delta\varepsilon(N, T, f, t_h)$
- Ramberg-Osgood constants, cyclic $n(N, f, T, t_h)$ and $A'(N, f, T, t_h)$

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- Constants for $da/dt(\Delta\varepsilon, a, T, t_h)$
 - $\Delta K_{TH}(R, f, T, t_h)$, Paris constants ($A(R, f, T, t_h)$ and $m(R, f, T, t_h)$)
- Table L 3 Creep assessment material property data sources**

MATERIAL		TEMP °C	REFERENCE(S) FOR SOURCE(S) OF INDICATED MATERIAL PROPERTY DATA						
DESIGNATION	CONDITION		DEFECT-FREE ASSESSMENT			DEFECT ASSESSMENT			
			$R_{u/T}$	$A_{u/T}$	$\epsilon_p(t, T, \sigma)$	δ_i	$t(C^*_o)$	$t(K_{mat})$	$da/dt(C^*)$
C-Mn STEELS									
LOW ALLOY FERRITIC STEELS									
1¼CrMo	wrought, virgin, aged	525-540	L.19,L.21		L.18				L.22,L.23,L.24 L.25
1¼CrMo	HAZ	540-545							L.26
1¼CrMo	weld metal	525							L.24,L.25
2¼CrMo	wrought, virgin, HAZ	538-600	L.18,L.19,L.20 L.21		L.18	L.27	L.30		L.26,L.27,L.28 L.29,L.30
2¼CrMo	HAZ	565					L.30		L.30
2¼CrMo	weld metal	545-565				L.31			L.31,L.32,L.33 L.34
2¼CrMo	weld fusion line	540							L.29
½Cr½Mo¼V	wrought	540-620	L.18,L.19,L.20		L.18		L.35		L.28,L.35,L.36 L.37
½Cr½Mo¼V	CGHAZ	565				L.31			L.31,L.37
½Cr½Mo¼V	ICHAZ (Type IV)	540-620					L.35		L.35,L.38
1CrMoV	rotor forging, virgin	530-550	L.21			L.39,L.40	L.30,L.40		L.30,L.41,L.42 L.43
1CrMoV	rotor forging, ex service	500-550							L.44
1CrMoV	casting	530-550					L.30,L.45		L.45
5-12Cr MARTENSITIC STEELS									
P91	wrought	538-625	L.19,L.20,L.21				L.30		L.30
P91	HAZ	538-625							L.30

Table L 3 continued

MATERIAL		TEMP °C	REFERENCE(S) FOR SOURCE(S) OF INDICATED MATERIAL PROPERTY DATA						
DESIGNATION	CONDITION		DEFECT-FREE ASSESSMENT			DEFECT ASSESSMENT			
			$R_{u/t/T}$	$A_{u/t/T}$	$\varepsilon_p(t, T, \sigma)$	δ_i	$t_i(C^*_o)$	$t_i(K_{mat})$	$da/dt(C^*)$
CrNi AUSTENITIC STEELS									
TP304	wrought	594-760	L.19,L.20,L.21						L.46,L.47
TP304	cast	650							L.48
TP316, TP316H	wrought	500-800	L.19,L.20,L.21		L.49				L.30,L.50
TP316	weld metal	560-800							L.33,L.51,L.52
TP316L, TP316LN	wrought	550-650	L.19,L.20,L.21				L.30,L.53		L.54,L.55
TP321	wrought	650-700	L.19,L.20,L.21						L.56,L.57
NiCr AUSTENITIC STEELS									
Ni-BASE ALLOYS									
Ti-BASE ALLOYS									
Al-BASE ALLOYS									

Table L 4 Typical constants for deriving creep crack growth rate from $\dot{a} = A \cdot (C^*)^q$

MATERIAL	TEMP °C	UPPER BOUND		MEAN	
		A	q	A	q
Plain C steels	482-538	0.015	1.00	0.006	1.00
½Cr½Mo¼V, wrought and cast	500-600	0.060	0.80	0.006	0.80
½Cr½Mo¼V, ICHAZ (Type IV)	545-565	0.150	0.80	0.007	0.80
½Cr½Mo¼V, CGHAZ	565	0.300	0.80	0.100	0.80
1CrMo	450-600	0.020	0.84	0.006	0.84
1CrMoV	538-594	0.015	0.75	0.005	0.79
2¼CrMo, wrought	550-600	0.006	0.80	0.004	0.83
2¼CrMo, weld metal	540-565	0.015	0.647	0.003	0.647
9CrMoVNb, wrought	580-593	0.004	0.65	0.003	0.70
Type 304, Type 304H, wrought	650-760	0.035	1.00	0.007	1.00
Type 304, service exposed	760	0.099	0.85	0.050	0.85
Type 321, wrought	650	0.020	0.90	0.005	0.90
Type 316, Type 316H, wrought	500-550	0.023	0.81	0.003	0.81
Type 316, weld metal	600-650	0.057	0.876	0.010	0.876
Inconel 800H	800	0.080	0.90	0.025	0.90
In 939	850	0.200	1.00	0.040	1.00
Astroloy API	700	0.124	0.78	0.054	0.79
Aluminium alloy RR58	150	2.484	0.85	1.501	0.85
Aluminium alloy 2519-T851	135	0.351	0.90	0.175	0.90

Table based on Table T.1 in BS7910:1999 with units changed to \dot{a} in units of m/h and C^* in units of MPa.m/h with minor amendments

L.5 Material Properties For Corrosion and Environmental Cracking Assessment

Sources of material property data for corrosion (environmental cracking) assessment are given in **Table L 5**.

Corrosion and environmental cracking

@SCCI

$\Delta\sigma_{SCCI}$ not considered ?

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• K_{ISCC} , constants for $da/dt(K, T, env)$

@Corr FI

• $HCF - \sigma_0(\sigma_m, R, T, env)$

• $LCF - constants for \Delta\epsilon(N, f)$

- *Ramberg-Osgood constants, cyclic $n(N, f, T)$ and $A'(N, f, T)$*

@Corr FCG

- $\Delta K_{TH}(R, f, T, env)$, *Paris constants $(A(R, f, T, env)$ and $m(R, f, T, env)$*

@LTA (wall thinning)

-

Table L 5 Corrosion and environmental cracking assessment material property data sources

MATERIAL		ENVIRONMENT	TEMP °C	$x(t)$	REFERENCE(S) FOR SOURCE(S) OF INDICATED MATERIAL PROPERTY DATA		
DESIGNATION	CONDITION				DEFECT-FREE ASSESSMENT		
					σ_{sccI}	$\sigma_{o,a}^{Env}$	$S-N, N(\Delta\epsilon)^{Env}$
C-Mn STEELS							
LOW ALLOY FERRITIC STEELS							
NiCrMoV	various	Steam, water	90-100		L.58		L.59
NiCrMoV	various	30% NaOH soln.	80				
MARTENSITIC STEELS							
12Cr(Ni)MoV	various	Steam, water	100-130		L.60	L.60-L.62	L.59
15Cr5NiCuMo	various	Steam, water	100		L.60	L.60	
13Cr8NiMo	various	Steam, water	100		L.60	L.60	
CrNi AUSTENITIC STEELS							
NiCr AUSTENITIC STEELS							
Ni-BASE ALLOYS							
Ti-BASE ALLOYS							
Al-BASE ALLOYS							

Table L 5 continued

MATERIAL		ENVIRONMENT	TEMP °C	REFERENCE(S) FOR SOURCE(S) OF INDICATED MATERIAL PROPERTY DATA			
DESIGNATION	CONDITION			DEFECT ASSESSMENT			
				K_{ISCC}	$da/dt(K)$	ΔK_T^{Env}	$da/dN(\Delta K)^{Env}$
C-Mn STEELS							
LOW ALLOY FERRITIC STEELS							
NiCrMoV	various	Steam, water		L.58,L.63	L.58,L.63	L.63	L.63
MARTENSITIC STEELS							
12CrMoV	various	Steam, water		L.60	L.60,L.64	L.60,	L.60
15Cr5NiCuMo	various	Steam, water		L.60	L.60,L.64	L.60	L.60
13Cr8NiMo	various	Steam, water		L.60	L.60,L.64	L.60	L.60
CrNi AUSTENITIC STEELS							
NiCr AUSTENITIC STEELS							
Ni-BASE ALLOYS							
Ti-BASE ALLOYS							
Al-BASE ALLOYS							

L.6 NASGRO 3.0 MATERIALS CONSTANTS SI (ESA) Units (MPa, MPa√mm)

G2-2

Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK ₀	C ⁺ _{th}	C _{th}	R _{cl}	α	S.R.
[A] Iron, alloy or cast																	
<u>ASTM Specification</u>																	
A536 Grd 80-55-06																	
As cast	A1AC50AB1	400	552	1564	1112	0.75	0.50	0.604E-12	2.900	0.5	0.5	278	2.0	0.1	0.7	2.5	0.3
[B] ASTM spec. grd. Steel																	
<u>A10 Series</u>																	
A36																	
Plt(Dyn K _{Ic} , < 500Hz); LA, HHA, 3% NaCl	B0CB10AB1	303	538	3475	2432	0.75	0.5	0.605E-12	3.000	0.5	0.5	243	2.0	0.1	0.7	2.0	0.3
ES Weld & HAZ(Dyn K _{Ic} , < 500Hz); LA,HHA, 3% NaCl	B0CZK1AB1	303	538	3475	2432	0.75	0.5	0.605E-12	3.000	0.5	0.5	243	2.0	0.1	0.7	2.0	0.3
<u>A200 Series</u>																	
A203 Grd E (3.5% Ni)																	
Plt	B2CE12AB1	490	552	7992	5907	0.75	0.5	0.168E-11	2.688	0.5	0.5	243	2.0	0.1	0.7	2.5	0.3
Plt; -73C	B2CE12LA7	565	662	9729	6949	0.75	0.5	0.168E-11	2.688	0.5	0.7	243	2.0	0.1	0.7	2.5	0.3
A216 Grd WCC																	

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Casting	B2GC51AB1	331	552	6949	5212	0.75	0.5	0.182E-12	3.000	0.5	0.5	243	2.0	0.1	0.7	2.5	0.3
<u>A300 Series</u>																	
A302 Grd B																	
Plt	B3AB12AB1	379	621	4170	3475	0.75	0.5	0.662E-14	3.480	0.5	0.5	243	2.0	0.1	0.7	2.5	0.3
A372 Type IV																	
Forg	B3GD21AB1	448	724	4170	3475	0.75	0.5	0.662E-14	3.480	0.5	0.5	208	2.0	0.1	0.7	2.5	0.3
A387 Grd 22, Cl 2																	
Plt	B3IQ10AB1	345	517	4170	3475	0.75	0.5	0.242E-12	3.000	0.5	0.5	243	2.0	0.1	0.7	2.5	0.3
<u>A400 Series</u>																	
A469 Cl 4																	
Forg	B4JD26AB1	586	724	7992	5907	0.75	0.5	0.111E-11	2.800	1.0	0.5	191	1.7	0.1	0.7	2.5	0.3
A469 Cl 5																	
Forg	B4JE20AB1	655	793	7992	5907	0.75	0.5	0.123E-11	2.800	0.5	0.5	153	1.1	0.1	0.7	2.5	0.3
<u>A500 Series</u>																	
A508 Cl2 & Cl3																	
Forg	B5AC21AB1	448	689	4865	3475	0.75	0.5	0.778E-10	2.800	0.5	0.5	208	2.2	0.1	0.7	2.5	0.3
A514 Typ F																	
Plt	B5BF10AB1	724	827	3996	2953	0.75	0.5	0.557E-11	2.570	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3

GMA SR Weld	B5BFC2AB1	689	793	3996	2953	0.75	0.5	0.418E-11	2.570	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3
A517 Grd F (T1 Steel)																	
Plt	B5DF12AB1	689	862	4865	3475	0.75	0.5	0.103E-13	3.500	0.25	0.25	208	1.5	0.1	0.7	2.5	0.3
A533-B, C11 & C12																	
Plt	B5HD10AB1	483	689	6949	5212	0.75	0.5	0.176E-11	2.700	0.5	0.5	226	2.8	0.1	0.7	2.5	0.3
SMA Weld	B5HDF1AB1	414	621	4865	3475	0.75	0.5	0.159E-12	3.138	0.5	0.25	341	3.0	0.1	0.7	2.5	0.3
A553 Typ I																	
Plt	B5QA12AB1	655	758	8687	6254	0.75	0.5	0.316E-9	2.000	0.25	0.25	156	1.5	0.1	0.7	2.5	0.3
Plt; -196C	B5QA12LA4	1034	1207	4865	3475	0.75	0.5	0.893E-13	3.200	0.25	0.25	208	1.5	0.1	0.7	2.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	DK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[B] ASTM spec. grade steel																	
<u>A500 Series</u>																	
A579 Grd 75 (12% Ni)																	
Forg	B5VW20AB1	1241	1310	4343	3127	0.75	0.5	0.316E-9	2.000	0.25	0.25	104	1.0	0.1	0.7	2.5	0.3
A588 Grd A & Grd B																	

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Plt	B5XA11AB1	379	552	4865	3475	0.75	0.5	0.731E-13	3.300	0.5	0.5	295	2.0	0.1	0.7	2.5	0.3
Plt; 3% NaCl, >0.2 Hz	B5XA11WB1	379	552	4865	3475	0.75	0.5	0.146E-12	3.300	0.5	0.5	295	2.0	0.1	0.7	2.5	0.3
A645 (5% Ni)																	
Plt	B6GA12AB1	517	724	8687	6254	0.75	0.5	0.607E-11	2.500	0.25	0.25	174	1.5	0.1	0.7	2.5	0.3
Plt; -196C	B6GA12LA4	758	1138	3822	2780	0.75	0.5	0.175E-13	3.500	0.25	0.25	243	1.5	0.1	0.7	2.5	0.3
[C] AISI - SAE Steel																	
<u>AISI 10xx-12xx Steel</u>																	
Low Carbon 1005-1012																	
Hot rolled plt	C1AB11AB1	172	310	3475	2432	0.75	0.5	0.576E-14	3.600	0.5	0.5	278	2.0	0.1	0.7	2.5	0.5
Low Carbon 1015-1025																	
Hot rolled plt	C1BB11AB1	207	400	3475	2432	0.75	0.5	0.576E-14	3.600	0.5	0.5	278	2.0	0.1	0.7	2.5	0.5
<u>AISI 43xx-48xx Steel</u>																	
4330V MOD																	
1240-1380 UTS; Plt & Forg	C4BS10AB1	1207	1310	5212	3822	0.75	0.5	0.228E-11	2.700	0.25	0.25	191	1.5	0.1	0.7	2.5	0.3
1380-1520 UTS; Plt & Forg	C4BT10AB1	1344	1448	3822	2780	0.75	0.5	0.228E-11	2.700	0.25	0.25	156	1.5	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg	C4BU10AB1	1482	1586	2953	2259	0.75	0.75	0.228E-11	2.700	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3
4340																	
1100-1240 UTS; Plt & Forg	C4DC21AB1	1069	1172	6602	4691	0.75	0.5	0.298E-11	2.700	0.25	0.25	208	2.0	0.1	0.7	2.5	0.3

1240-1380 UTS; Plt & Forg; HHA	C4DD11AD1	1207	1310	5386	3822	0.75	0.5	0.281E-11	2.700	0.25	0.25	191	1.5	0.1	0.7	2.5	0.3
1240-1380 UTS; Plt & Forg	C4DD21AB1	1207	1310	5386	3822	0.75	0.5	0.228E-11	2.700	0.25	0.25	191	1.5	0.1	0.7	2.5	0.3
1380-1520 UTS; Plt & Forg	C4DE11AB1	1344	1448	3822	2780	0.75	0.5	0.228E-11	2.700	0.25	0.25	156	1.0	0.1	0.7	2.5	0.3
1380-1520 UTS; Plt & Forg; -45C	C4DE11LB7	1379	1517	2432	1911	0.75	0.5	0.298E-11	2.700	0.25	0.25	156	1.0	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg	C4DF11AB1	1482	1586	2953	2259	0.75	0.75	0.228E-11	2.700	0.25	0.25	139	0.5	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; -45C	C4DF11LB7	1551	1655	1911	1564	0.75	0.75	0.298E-11	2.700	0.25	0.25	139	0.5	0.1	0.7	2.5	0.3
1660-1930 UTS; Plt & Forg	C4DG11AB1	1655	1793	2259	1911	0.75	1.0	0.228E-11	2.700	0.25	0.25	122	0.2	0.1	0.7	2.8	0.3
1660-1930 UTS; Plt & Forg; -45C	C4DG11LB7	1724	1862	1564	1390	0.75	1.0	0.298E-11	2.700	0.25	0.25	122	0.2	0.1	0.7	2.8	0.3
[D] Misc. U.S. Spec. Grade Steel																	
<u>SAE Spec Steel</u>																	
0030 Cast	D5AC50AB1	303	496	3301	2432	0.75	0.5	0.348E-15	4.000	0.25	0.25	278	2.0	0.1	0.7	2.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[E] Trade/common name steel																	
<u>Ultra High Strength Steel</u>																	
18 Ni Maraging																	
250 Grd; Plt & Forg	E1AD10AB1	1655	1793	3127	2606	0.75	0.75	0.876E-11	2.600	0.25	0.25	104	0.4	0.1	0.7	2.5	0.3
300 Grd; Plt & Forg	E1AE10AB1	1931	1999	2953	2432	0.75	0.75	0.751E-11	2.600	0.25	0.25	104	0.1	0.1	0.7	2.8	0.3
300M																	
1860-2070 UTS; Plt & Forg	E1BF21AB1	1655	1965	2259	1911	0.75	1.0	0.206E-10	2.460	0.25	0.25	104	0.1	0.1	0.7	2.8	0.3
AF1410																	
1520-1660 UTS; Plt & Forg; -54C	E1CC12AA7	1655	1724	5212	3822	0.75	0.50	0.621E-10	2.200	0.25	0.25	104	0.4	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; LA, HHA / DW > 1Hz	E1CC12AB1	1517	1586	6254	4691	0.75	0.50	0.103E-9	2.200	0.25	0.25	104	0.6	0.1	0.7	2.5	0.3
D6AC																	
1520-1660 UTS; Plt & Forg; Nom. K _{Ic} (2430); -40C	E1DD10AA8	1551	1655	2432	1737	0.75	0.75	0.418E-11	2.570	0.25	0.25	139	0.5	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; Nom. K _{Ic} (2430)	E1DD10AB1	1482	1586	3475	2432	0.75	0.75	0.891E-11	2.570	0.25	0.25	139	0.8	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; Nom. K _{Ic} (2430); HHA/DW>0.1Hz	E1DD10AD1	1517	1586	3475	2432	0.75	0.75	0.251E-10	2.570	0.25	0.25	139	0.32	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; High K _{Ic} (3130)	E1DJ10AB1	1482	1586	4170	3127	0.75	0.75	0.891E-11	2.570	0.25	0.25	139	0.8	0.1	0.7	2.5	0.3
HP-9-4-20																	
1310-1450 UTS; Plt & Forg; L-T, T-L; HHA, SW > 1 Hz	E1EB23AB1	1310	1379	4691	3822	0.75	0.50	0.544E-10	2.320	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3

1310-1450 UTS; Plt & Forg; L-T, T-L; -54C	E1EB23AC7	1379	1448	4691	3822	0.75	0.50	0.338E-10	2.320	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
1310-1450 UTS; GTA Weld + SR; LA, HHA, SW > 1 Hz	E1ECB2WA1	1276	1344	4691	3822	0.75	0.50	0.554E-10	2.320	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
1310-1450 UTS; GTA Weld + SR; -54C	E1ECB2AC7	1344	1413	4691	3822	0.75	0.50	0.338E-10	2.320	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
HP-9-4-30																	
1520-1660 UTS; Plt & Forg; L-T, T-L; LA, HHA, SW > 1 Hz	E1GC23AB1	1413	1586	3996	3127	0.75	0.50	0.554E-10	2.320	0.25	0.25	139	0.8	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; L-T, T-L; -54C	E1GC23AA7	1482	1655	3996	3127	0.75	0.50	0.554E-10	2.320	0.25	0.25	139	0.8	0.1	0.7	2.5	0.3
1520-1660 UTS; Plt & Forg; L-T, T-L; 315C	E1GC23AA14	1138	1344	3822	2953	0.75	0.50	0.554E-10	2.320	0.25	0.50	139	0.8	0.1	0.7	2.5	0.3
HY-180(10Ni)																	
Plt & Forg	E1IB13AB1	1241	1379	6949	5212	0.75	0.50	0.435E-10	2.300	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3
Plt & Forg; DW, ASW > 0.1 Hz	E1IB13WA1	1241	1379	6949	5212	0.75	0.50	0.871E-10	2.300	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3
Plt & Forg; SW > 0.1 Hz	E1IB13WB1	1344	1379	6949	5212	0.75	0.50	0.228E-11	2.806	0.25	0.25	174	1.37	0.1	0.7	2.5	0.3
HY-TUF																	
1520-1660 UTS; VAR Forg	E1JB23AB1	1379	1586	5212	3822	0.75	0.75	0.125E-10	2.500	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3
H-11 MOD																	
1660-1800 UTS; Plt & Forg	E1LE23AB1	1482	1724	2085	1737	0.75	0.75	0.263E-11	2.700	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{el}	α	S.R.
[E] Trade/Common Name Steel																	
<u>Pressure Vessel / Piping</u>																	
HY 80																	
Plt	E2AA13AB1	621	724	8687	6949	0.75	0.50	0.536E-11	2.500	0.25	0.25	191	1.9	0.1	0.6	2.5	0.3
Plt; 3.5% NaCl / SW > 0.1 Hz	E2AA13WB1	621	724	8687	6949	0.75	0.50	0.107E-10	2.500	0.25	0.25	191	1.9	0.1	0.6	2.5	0.3
HY 130																	
Plt	E2CA13AB1	965	1034	8687	6949	0.75	0.50	0.107E-10	2.500	0.25	0.25	174	1.3	0.1	0.6	2.5	0.3
Plt; 3.5% NaCl / SW > 0.1 Hz	E2CA13WB1	965	1034	8687	6949	0.75	0.50	0.250E-10	2.500	0.25	0.25	174	1.3	0.1	0.6	2.5	0.3
GMA Weld	E2CAC1AB1	896	965	8687	6949	0.75	0.50	0.535E-11	2.500	0.25	0.25	174	1.5	0.1	0.6	2.5	0.3
SMA Weld	E2CAF1AB1	896	965	8687	6949	0.75	0.50	0.428E-11	2.500	0.25	0.25	174	1.5	0.1	0.6	2.5	0.3
<u>Construction Grade</u>																	
HT-80																	
Plt	E3BA13AB1	758	827	6949	5212	0.75	0.50	0.424E-12	3.000	0.25	0.25	278	2.0	0.1	0.7	2.5	0.3
SA Weld	E3BAH1AB1	655	793	6949	5212	0.75	0.50	0.439E-11	2.700	0.25	0.25	87	0.2	0.1	0.7	2.5	0.3

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[F] AISI type stainless steel																	
<u>AISI 300 Series</u>																	
AISI 301/302																	
Ann Plt & Sht	F3AA13AB1	276	621	9729	6949	1.0	0.50	0.363E-12	3.0	0.25	0.25	104	1.0	0.1	0.7	2.5	0.3
1/2 Hard sht	F3AC13AB1	862	1138	4865	3475	1.0	0.50	0.787E-12	3.0	0.25	0.25	104	0.5	0.1	0.7	2.5	0.3
Full Hard sht	F3AE13AB1	1310	1413	3822	2780	1.0	0.50	0.569E-10	2.2	0.25	0.25	104	0.2	0.1	0.7	2.5	0.3
AISI 304/304L																	
Ann Plt & Sht, Cast; 288C Air	F3DA13AA13	165	441	6949	5212	1.0	0.50	0.697E-15	4.0	0.25	0.25	208	2.5	0.1	0.7	2.5	0.3
Ann Plt & Sht, Cast; 427C Air, >1Hz	F3DA13AA16	138	434	4865	3475	1.0	0.50	0.209E-14	4.0	0.25	0.25	243	2.5	0.1	0.7	2.5	0.3
Ann Plt & Sht, Cast	F3DA13AB1	276	621	9729	6949	1.0	0.50	0.363E-12	3.0	0.25	0.25	104	1.0	0.1	0.7	2.5	0.3
Ann Plt & Sht, Cast; -196C LN2	F3DA13LA4	689	1413	9729	6949	1.0	0.50	0.357E-13	3.2	0.25	0.25	243	1.3	0.1	0.7	2.5	0.3
SA weld (308 filler) + SR; 427C Air, >1 Hz	F3DAH2AA16	338	476	4865	3475	1.0	0.5	0.174E-14	4.0	0.25	0.25	278	2.0	0.1	0.7	2.5	0.3
SA weld (308 filler) + SR	F3DAH2AB1	455	738	6949	5212	1.0	0.5	0.315E-14	3.68	0.25	0.25	208	2.0	0.1	0.7	2.5	0.3
AISI 316/316L																	
Ann Plt & Sht, Cast; 316C Air	F3KA13AA14	221	414	6949	5212	1.0	0.5	0.131E-14	4.0	0.25	0.25	208	2.0	0.1	0.7	2.5	0.3

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Ann Plt & Sht, Cast; 427C Air	F3KA13AA16	138	414	4865	3475	1.0	0.5	0.174E-14	4.0	0.25	0.25	278	2.5	0.1	0.7	2.5	0.3
Ann Plt & Sht, Cast	F3KA13AB1	248	621	9729	6949	1.0	0.50	0.485E-12	3.0	0.25	0.25	121	1.0	0.1	0.7	2.5	0.3
Ann Plt & Sht, Cast; -269C Lhe	F3KA13LA2	552	1482	9729	6949	1.0	0.5	0.655E-13	3.2	0.25	0.25	278	1.5	0.1	0.7	2.5	0.3
Ann Plt & Sht, Cast; -196C LN2	F3KA13LA4	483	1276	9729	6949	1.0	0.5	0.655E-13	3.2	0.25	0.25	243	1.3	0.1	0.7	2.5	0.3
Cast; 316 Air	F3KA50AA14	221	517	7297	5212	1.0	0.5	0.122E-14	4.0	0.50	0.50	121	1.0	0.1	0.7	2.5	0.3
Cast	F3KA50AB1	248	621	9729	6949	1.0	0.5	0.484E-12	3.0	0.25	0.25	121	1.0	0.1	0.7	2.5	0.3
Cast; -269C Lhe	F3KA50LA2	545	1448	9729	6949	1.0	0.5	0.655E-13	3.2	0.25	0.25	243	2.5	0.1	0.7	2.5	0.3
Cast; -196C LN2	F3KA50LA4	496	1241	9729	6949	1.0	0.5	0.655E-13	3.2	0.25	0.25	243	2.5	0.1	0.7	2.5	0.3
SMA weld (316 filler) + SR; 427C Air, >1Hz	F3KAH2AA16	338	476	3822	2780	1.0	0.5	0.130E-17	5.0	0.25	0.25	278	3.0	0.1	0.7	2.5	0.3
20% CW Plt & Sht	F3KB13AB1	689	758	4865	3475	1.0	0.50	0.242E-12	3.0	0.25	0.25	174	1.0	0.1	0.7	2.5	0.3
<u>AISI 400 Series</u>																	
AISI 430 VAR																	
Ann Rnd, C-R	F4LA16AB1	234	407	3961	2780	1.0	0.5	0.124E-14	3.8	0.50	0.25	486	3.0	0.1	0.7	5.84	1.0
AISI 440C Steel																	
Single temper 232C/2hr, T-L	F4SE12AB1	1862	1999	591	591	1.0	0.5	0.764E-12	3.1	0.25	0.25	132	0.5	0.1	0.7	2.5	0.3

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[G] Misc. CRES/heat resistant steel																	
<u>PHxx-x Alloys</u>																	
PH13-8Mo																	
H1000; Plt, Forg, extr	G1AD13AB1	1379	1434	4865	3475	0.75	0.75	0.583E-11	2.620	0.25	0.25	174	1.0	0.1	0.6	2.5	0.3
H1000; Plt & Forg; DW & SW, >1Hz	G1AD13WD1	1379	1434	4865	3475	0.75	0.75	0.431E-11	2.800	0.50	0.50	208	1.0	0.1	0.6	2.5	0.3
H1050; Plt & Forg	G1AF13AB1	1276	1310	5560	3996	0.75	0.75	0.466E-11	2.620	0.25	0.25	174	1.0	0.1	0.6	2.5	0.3
H1050; Plt & Forg; DW & SW, >0.1Hz	G1AF13WD1	1276	1310	5560	3996	0.75	0.75	0.305E-14	4.100	0.50	0.50	243	1.5	0.1	0.4	2.5	0.3
<u>xx-xPH Alloys</u>																	
15-5PH																	
H900; Rnd, C-R	G2AB16AB1	1172	1310	2259	1737	1.0	0.5	0.136E-14	4.000	0.25	0.25	174	1.9	0.1	0.7	2.5	0.3
H1025; Rnd, C-R	G2AD16AB1	1138	1207	2780	2085	1.0	0.5	0.144E-13	3.600	0.25	0.25	174	1.9	0.1	0.7	2.5	0.3
H1025; Forg	G2AD23AB1	1069	1138	5212	3822	1.0	0.5	0.797E-12	2.870	0.25	0.25	174	1.5	0.1	0.7	2.5	0.3
H1100; Rnd, C-R	G2AF16AB1	1000	1069	3822	2780	1.0	0.5	0.191E-12	3.100	0.25	0.25	174	1.4	0.1	0.7	2.5	0.3
17-4PH																	
H900; Plt, L-T	G2CB11AB1	1172	1344	2085	1737	1.0	0.5	0.246E-12	3.110	0.25	0.25	139	0.8	0.1	0.7	2.5	0.3
H900; Plt, T-L	G2CB12AB1	1172	1344	1911	1564	1.0	0.5	0.879E-13	3.400	0.25	0.25	139	0.8	0.1	0.7	2.5	0.3
H1050; Plt	G2CE13AB1	1069	1103	2780	2085	1.0	0.5	0.464E-13	3.420	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3

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H1025; Rnd, C-L	G2CE19AB1	1103	1124	2432	1911	1.0	0.5	0.154E-13	3.500	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
H1025; Cast; HHA	G2CE50AD1	1103	1124	2432	1911	1.0	0.5	0.411E-13	3.500	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
H1100; Plt; HHA	G2CH13AD1	1000	1034	4170	3127	1.0	0.5	0.992E-11	2.470	0.25	0.25	139	1.5	0.1	0.7	2.5	0.3
17-7PH																	
TH1050; Plt	G2EH13AB1	1172	1310	2085	1737	1.0	1.0	0.513E-13	3.400	0.25	0.25	104	0.5	0.1	0.7	2.5	0.3
<u>AMxxx Alloys</u>																	
AM 350																	
CRT; Sht, L-T	G4AH11AB1	1276	1413	4170	3127	1.0	1.5	0.464E-11	2.500	0.25	0.25	174	1.5	0.1	0.7	2.5	0.3
AM 367																	
SCT(850); Sht	G4FC11AB1	1655	1675	2780	2259	1.0	1.0	0.432E-10	2.150	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
<u>Custom xxx Alloys</u>																	
Custom 455																	
H1000; Plt & Forg	G5BD23AB1	1344	1413	4865	3475	1.0	0.5	0.132E-10	2.440	0.25	0.25	139	1.0	0.1	0.7	2.5	0.3
H1025; Forg, C-R	G5BE26AB1	1276	1344	5212	3822	1.0	0.5	0.129E-11	2.760	0.25	0.25	146	1.5	0.1	0.7	2.5	0.3
<u>Nitronic xx Alloys</u>																	
Nitronic 33																	
Ann; Plt	G7AA13AB1	441	793	9729	6949	1.0	0.5	0.445E-15	3.850	0.25	0.25	313	2.5	0.1	0.7	2.5	0.3
Ann; Plt; -296C LHe	G7AA13LA2	1517	1793	2780	2259	1.0	0.5	0.351E-17	5.000	0.25	0.25	313	2.0	0.1	0.7	2.5	0.3

Ann; Plt; -196C LN2	G7AA13LA4	1138	1517	5212	3822	1.0	0.5	0.871E-15	4.000	0.25	0.25	313	2.2	0.1	0.7	2.5	0.3
Nitronic 50																	
Ann; Plt	G7CA13AB1	531	827	8687	6254	1.0	0.5	0.709E-15	3.800	0.25	0.25	313	2.5	0.1	0.7	2.5	0.3
Ann; Plt; -296C Lhe	G7CA13LA2	1448	1896	4170	3127	1.0	0.5	0.138E-16	4.300	0.25	0.25	313	2.0	0.1	0.7	2.5	0.3
Ann; Plt; -196C LN2	G7CA13LA4	1172	1586	5212	3822	1.0	0.5	0.103E-14	3.650	0.25	0.25	313	2.2	0.1	0.7	2.5	0.3
Nitronic 60																	
HR, CR; Rnd Rod	G7DC18AB1	945	1324	2919	2085	0.75	0.5	0.701E-10	2.100	0.50	0.50	108	0.74	0.1	0.7	2.54	0.34

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

4For C_{th} calculation only (by-pass of closure analysis for da/dN)

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _o	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[H] High temperature steel																	
<u>Nickel Chromium</u>																	
A286 (965 MPa)																	
Plt & Sht; 315-427C	H1AB13AA15	655	951	3822	2780	1.0	0.5	0.116E-11	2.930	0.25	0.25	208	1.0	0.1	0.7	2.5	0.3
Plt & Sht	H1AB13AB1	689	965	4865	3475	1.0	0.5	0.303E-12	3.000	0.25	0.25	208	1.0	0.1	0.7	2.5	0.3
Forg, L-T, T-L, L-R	H1AB23AB1	689	965	4865	3475	1.0	0.5	0.209E-13	3.300	0.25	0.25	208	1.0	0.1	0.7	2.5	0.3
A286 (1100 MPa)																	
Plt & Sht; 315-427C	H1AC13AA15	655	951	3822	2780	1.0	0.5	0.727E-12	3.000	0.25	0.25	208	1.0	0.1	0.7	2.5	0.3
Plt & Sht	H1AC13AB1	724	1103	4865	3475	1.0	0.5	0.774E-13	3.200	0.25	0.25	208	1.0	0.1	0.7	2.5	0.3
Forg. rod, L-R	H1AC28AB1	827	1103	4865	3475	1.0	0.5	0.754E-11	2.450	0.25	0.25	156	0.5	0.1	0.5	3.0	0.3
A286 (1380 MPa Bolt Material)																	
Forg. rod, L-R	H1AD28AB1	1310	1379	4865	3475	1.0	0.5	0.443E-10	2.100	0.25	0.25	122	0.2	0.1	0.2	3.0	0.3
JBK-75																	
ST-CR-A; Plt, T-L	H1CB12AB1	1034	1241	4170	3127	1.0	0.5	0.102E-10	2.400	0.25	0.25	295	1.5	0.1	0.7	2.5	0.3

[J] Tool Steel																	
<u>AISI Tool Steel</u>																	
M-50																	
61-63 Rc; Plt	J1IK10AB1	2241	2586	452	452	1.0	0.5	0.448E-12	3.180	0.1	0.1	83	0.0	0.1	0.7	3.0	0.3
T1(18-4-1)																	
60-63 Rc; Plt	J1MA10AB1	2241	2413	522	521	1.0	0.5	0.124E-13	3.800	0.1	0.1	83	0.0	0.1	0.7	3.0	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[M] 1000-9000 Series aluminum																	
<u>2000 Series</u>																	
2014-T6																	
Plt & Sht; L-T	M2AD11AB1	448	510	1320	938	1.0	1.0	0.431E-10	2.800	0.5	1.0	94	1.5	0.1	0.7	1.5	0.3
Plt & Sht ; T-L	M2AD12AB1	434	490	799	625	1.0	1.0	0.431E-10	2.800	0.5	1.0	94	1.5	0.1	0.7	1.5	0.3
2014-T651																	
Plt & Sht; L-T	M2AF11AB1	441	490	973	764	1.0	1.0	0.185E-10	2.800	0.5	1.0	94	1.5	0.1	0.7	1.5	0.3
Plt & Sht; T-L	M2AF12AB1	441	490	938	695	1.0	1.0	0.185E-10	2.800	0.5	1.0	94	1.5	0.1	0.7	1.5	0.3
Plt & Sht; GTA Weld	M2AFB1AB1	165	324	778	556	1.0	1.0	0.151E-12	3.918	0.5	1.0	330	2.2	0.1	0.7	1.5	0.3
Plt & Sht; GTA Weld, SR	M2AFB2AB1	97	186	778	556	1.0	1.0	0.567E-15	5.005	0.5	0.5	139	2.0	0.1	0.7	1.5	0.3
2020-T651																	
Plt & Sht; L-T	M2CB11AB1	531	565	1008	782	1.0	1.0	0.159E-12	3.695	0.5	0.5	76	1.0	0.1	0.7	1.5	0.3
Plt & Sht; T-L	M2CB12AB1	538	565	730	591	1.0	1.0	0.629E-11	3.074	0.5	0.5	76	1.0	0.1	0.7	1.5	0.3
2024-T3																	

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Clad, Plt & Sht; L-T; LA & HHA	M2EA11AB1	365	455	1598	1147	1.0	1.0	0.183E-11	3.284	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
Clad, Plt & Sht; T-L; LA & HHA	M2EA12AB1	331	448	1425	1008	1.0	1.0	0.609E-10	2.601	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
Clad, Plt & Sht; L-T; DW	M2EA11WA1	365	455	1598	1147	1.0	1.0	0.744E-11	3.090	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
Clad, Plt & Sht; T-L; DW	M2EA12WA1	331	448	1425	1008	1.0	1.0	0.199E-11	3.282	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
2024-T351																		
Plt & Sht; L-T; 149C to 204C Air	M2EB11AA11	359	455	1598	1147	1.0	1.0	0.236E-10	2.956	0.5	1.0	90	1.5	0.1	0.7	1.5	0.3	
Plt & Sht; L-T; LA & HHA	M2EB11AB1	372	469	1668	1181	1.0	1.0	0.160E-11	3.353	0.5	1.0	90	1.5	0.1	0.7	1.5	0.3	
Plt & Sht; T-L; LA & HHA	M2EB12AB1	359	469	1425	1008	1.0	1.0	0.160E-11	3.353	0.5	1.0	90	1.5	0.1	0.7	1.5	0.3	
2024-T3511																		
Extr; L-T; LA & HHA	M2EC31AB1	379	531	1216	869	1.0	1.0	0.351E-10	2.700	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
2024-T62																		
Plt & Sht; L-T; LA, HHA & ASW	M2EG11AB1	400	455	1737	1251	1.0	1.0	0.298E-11	3.200	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
Plt & Sht; T-L; LA, HHA & ASW	M2EG12AB1	393	455	1459	1042	1.0	1.0	0.298E-11	3.200	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
2024-T81																		
Plt & Sht; L-T; 177C Air	M2EI11AA11	359	421	1216	869	1.0	1.0	0.148E-9	2.761	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3	
Plt & Sht; L-T	M2EI11AB1	434	517	1042	764	1.0	1.0	0.113E-9	2.763	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3	

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Plt & Sht; L-T; DA	M2EI11AC1	434	483	1032	764	1.0	1.0	0.194E-10	2.890	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3
Plt & Sht; L-T; HHA	M2EI11AD1	434	483	1032	764	1.0	1.0	0.244E-9	2.566	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3
Plt & Sht; T-L; 177C Air	M2EI12AA11	359	448	1112	799	1.0	1.0	0.833E-11	3.255	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3
Plt & Sht; T-L	M2EI12AB1	427	469	973	730	1.0	1.0	0.437E-11	3.313	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3
2024-T851																	
Plt & Sht; T-L; 149C to 177C Air	M2EJ12AA11	386	421	1181	834	1.0	1.0	0.142E-13	4.308	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3
Plt & Sht; L-T & T-L, LA, DA, JP-4	M2EJ13AB1	441	510	1077	799	1.0	1.0	0.637E-11	3.100	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3
Plt & Sht; L-T & T-L, 3.5% NaCl	M2EJ13WB1	441	483	1088	799	1.0	1.0	0.217E-9	2.480	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

Material; Condition; Environment*	Code	YS	UTS	K _{ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[M] 1000-9000 Series aluminum																	
<u>2000 Series</u>																	
2024-T852																	
Forg; L-T & T-L, LA & DA	M2EK23AB1	393	483	1362	973	1.0	1.0	0.113E-8	2.060	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3
2024-T861																	
Plt & Sht; L-T; 149C to 204C Air	M2EL11AA11	386	400	1737	1251	1.0	1.0	0.758E-11	3.181	0.5	1.0	97	1.5	0.1	0.7	1.5	0.3
Plt & Sht; L-T; LA & HHA	M2EL11AB1	503	524	1042	799	1.0	1.0	0.225E-10	2.920	0.5	1.0	76	1.0	0.1	0.7	1.5	0.3
Plt & Sht; T-L	M2EL12AB1	496	524	834	660	1.0	1.0	0.272E-10	2.895	0.5	1.0	76	1.0	0.1	0.7	1.5	0.3
2048-T851																	
Plt & Sht; L-T; LA, DA	M2FC11AB1	434	476	1703	1216	1.0	1.0	0.457E-12	3.460	0.5	1.0	94	1.5	0.1	0.7	1.5	0.3
Plt & Sht; T-L; LA, DA	M2FC12AB1	427	476	1459	1042	1.0	1.0	0.421E-13	3.951	0.5	1.0	94	1.5	0.1	0.7	1.5	0.3
2124-T851																	
Plt & Sht; L-T; 49C to 177C Air	M2GC11AA10	365	379	1494	1077	1.0	1.0	0.429E-11	3.233	0.5	0.5	101	1.7	0.1	0.7	1.5	0.3
Plt & Sht; L-T; LA, DA, HHA	M2GC11AB1	434	490	1459	1042	1.0	1.0	0.103E-10	3.000	0.5	0.5	104	1.7	0.1	0.7	1.5	0.3

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Plt & Sht; T-L; 149C to 204C Air	M2GC12AA11	365	379	1251	903	1.0	1.0	0.217E-12	3.715	0.5	1.0	101	1.7	0.1	0.7	1.5	0.3
Plt & Sht; T-L; LA, HHA	M2GC12AB1	441	496	1077	799	1.0	1.0	0.580E-11	3.061	0.5	1.0	104	1.7	0.1	0.7	1.5	0.3
Plt & Sht; T-L; -129C to -101C GN2	M2GC12GB6	496	552	1216	903	1.0	1.0	0.293E-12	3.400	0.5	1.0	94	1.7	0.1	0.7	1.5	0.3
Plt & Sht; S-T, S-L; LA, HHA	M2GC15AB1	414	476	973	730	1.0	1.0	0.723E-13	3.867	0.5	1.0	104	1.7	0.1	0.7	1.5	0.3
2219-T62																	
Plt & Sht; L-T	M2IA11AB1	296	421	1494	1077	1.0	1.0	0.771E-10	2.657	0.5	1.0	125	2.0	0.1	0.7	1.5	0.3
Plt & Sht; L-T & T-L; 177C Air	M2IA13AA11	255	317	1459	1042	1.0	1.0	0.110E-9	2.611	0.5	1.0	132	2.0	0.1	0.7	1.5	0.3
Plt & Sht; T-L	M2IA12AB1	296	421	1425	1008	1.0	1.0	0.887E-10	2.648	0.5	1.0	125	2.0	0.1	0.7	1.5	0.3
Plt & Sht; L-T & T-L; -196C LN2	M2IA13LA4	352	524	1459	1042	1.0	1.0	0.827E-12	3.178	0.5	1.0	101	1.5	0.1	0.7	1.5	0.3
2219-T851																	
Plt & Sht; L-T; LA, DA	M2IC11AB1	365	448	1598	1147	1.0	1.0	0.414E-11	3.156	0.5	1.0	104	1.7	0.1	0.7	1.5	0.3
Plt & Sht; T-L; LA, DA	M2IC12AB1	345	455	1494	1077	1.0	1.0	0.302E-10	2.863	0.5	1.0	73	1.0	0.1	0.7	1.5	0.3
2219-T87																	
Plt & Sht; L-T; 149C to 177C Air	M2IF11AA11	296	338	1355	973	1.0	1.0	0.930E-10	2.533	0.5	1.0	122	2.0	0.1	0.7	1.5	0.3
Plt & Sht; L-T	M2IF11AB1	393	469	1459	1042	1.0	1.0	0.214E-9	2.487	0.5	1.0	101	1.7	0.1	0.7	1.5	0.3
Plt & Sht; L-T; -196C LN2	M2IF11LA4	469	572	1981	1425	1.0	1.0	0.219E-11	3.151	0.5	1.0	80	1.0	0.1	0.7	1.5	0.3
Plt & Sht; T-L; 149C to 177C Air	M2IF12AA11	303	338	1320	938	1.0	1.0	0.661E-13	3.903	0.5	1.0	122	2.0	0.1	0.7	1.5	0.3

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Plt & Sht; T-L	M2IF12AB1	400	476	1320	938	1.0	1.0	0.103E-11	3.400	0.5	1.0	101	1.7	0.1	0.7	1.5	0.3
Plt & Sht; T-L; -196CLN2	M2IF12LA4	455	586	1598	1147	1.0	1.0	0.839E-17	5.279	0.5	1.0	80	1.5	0.1	0.7	1.5	0.3
Plt & Sht; GTA weld, PAR	M2IFB1AB1	138	290	1494	730	1.0	1.0	0.901E-13	4.060	0.5	1.0	139	2.0	0.1	0.7	1.5	0.3
Plt & Sht; GTA weld, PAR; -196C LN2	M2IFB1LA4	186	317	1529	799	1.0	1.0	0.267E-18	6.140	0.5	1.0	139	2.0	0.1	0.7	1.5	0.3
2324-T39																	
Plt & Sht; L-T	M2JA11AB1	448	496	1911	1355	1.0	1.0	0.390E-11	3.072	0.5	1.0	101	1.7	0.1	0.7	1.5	0.3
2090-T8E41																	
Plt & Sht; L-T	M2PA11AB1	552	586	1598	1147	1.0	1.0	0.108E-11	3.267	0.5	1.0	139	2.0	0.1	0.7	1.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	DK _O	C _{th} ⁺	C _{th} ⁻	R _{cl}	α	S.R.
[M] 1000-9000 Series aluminum																	
<u>5000 Series</u>																	
5083-O																	
Plt; T-L	M5BA12AB1	138	296	2189	1564	1.0	0.1	0.653E-8	1.938	0.5	1.0	174	2.0	0.1	0.7	1.5	0.3
<u>6000 Series</u>																	
6061-T6																	
Plt; T-L	M6AB13AB1	283	310	1251	903	1.0	0.75	0.653E-9	2.300	0.5	0.5	122	1.5	0.1	0.7	2.0	0.3
Plt; GTA weld, PAR	M6ABA1AB1	159	179	1251	903	1.0	1.0	0.107E-11	3.524	0.5	1.0	156	1.5	0.1	0.7	1.5	0.3
6061-T651																	
Plt;; L-T & T-L; 149C Air	M6AC13AA10	248	255	1320	938	1.0	1.0	0.757E-13	3.884	0.5	1.0	139	1.5	0.1	0.7	1.5	0.3
Plt; L-T & T-L	M6AC13AB1	303	324	1320	938	1.0	1.0	0.116E-8	2.248	0.5	1.0	122	1.5	0.1	0.7	1.5	0.3
6063-T5																	
Plt & Sht; T-L; LA	M6BA12AB1	145	186	1181	834	1.0	0.75	0.117E-11	3.447	0.5	1.0	122	1.5	0.1	0.7	1.9	0.3
<u>7000 Series</u>																	
7005-T6 & T63																	

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Plt & Sht; L-T	M7BA11AB1	331	365	2224	1598	1.0	1.0	0.864E-9	2.248	0.5	1.0	118	1.5	0.1	0.7	1.75	0.3
Plt & Sht; T-L	M7BA12AB1	331	365	1946	1390	1.0	1.0	0.581E-9	2.313	0.5	1.0	118	1.5	0.1	0.7	1.75	0.3
7010-T73651																	
Plt & Sht; L-T & L-S	M7DA11AB1	441	503	1494	1077	1.0	1.0	0.365E-11	3.122	0.5	1.0	87	1.0	0.1	0.7	1.75	0.3
7050-T73511																	
Extr; L-T; LA, HHA, DA	M7GE31AB1	496	552	1703	1216	1.0	1.0	0.112E-10	2.908	0.5	1.0	73	1.0	0.1	0.7	1.9	0.3
7050-T736 & T74																	
Forg; L-T	M7GI21AB1	448	496	1598	1147	1.0	1.0	0.101E-11	3.368	0.5	1.0	80	1.0	0.1	0.7	1.9	0.3
Forg; T-L	M7GI22AB1	427	496	1147	834	1.0	1.0	0.406E-10	2.677	0.5	1.0	80	1.0	0.1	0.7	1.9	0.3
7050-T73651 & T7451																	
Plt & Sht; L-T; LA & HHA	M7GJ11AB1	455	531	1494	1077	1.0	1.0	0.234E-9	2.379	0.5	1.0	83	1.5	0.1	0.7	1.9	0.3
Plt & Sht; L-T; DA	M7GJ11AC1	455	531	1494	1077	1.0	1.0	0.567E-9	2.084	0.5	1.0	83	1.5	0.1	0.7	1.9	0.3
Plt & Sht; T-L; LA & HHA	M7GJ12AB1	448	531	1216	869	1.0	1.0	0.640E-11	3.045	0.5	1.0	83	1.5	0.1	0.7	1.9	0.3
Plt & Sht; T-L; DA	M7GJ12AC1	448	531	1216	869	1.0	1.0	0.645E-11	2.865	0.5	1.0	83	1.5	0.1	0.7	1.9	0.3
Plt & Sht; S-T	M7GJ15AB1	421	517	1147	834	1.0	1.0	0.254E-10	2.674	0.5	1.0	97	2.0	0.1	0.7	1.9	0.3
7050-T74511																	

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Extr; L-T; LA & DW	M7GL31AB1	483	545	1737	1251	1.0	1.0	0.522E-10	2.682	0.5	1.0	76	0.4	0.1	0.7	1.9	0.3
7050-T73652 & T7452																	
Forg; L-T	M7GM21AB1	483	545	1494	1077	1.0	1.0	0.550E-10	2.654	0.5	1.0	87	0.42	0.1	0.7	1.9	0.3
Forg; T-L	M7GM22AB1	483	545	938	730	1.0	1.0	0.550E-10	2.654	0.5	1.0	87	0.42	0.1	0.7	1.9	0.3
7050-T7651																	
Plt & Sht; L-T; LA & HHA	M7GQ11AB1	517	552	1494	1077	1.0	1.0	0.218E-9	2.412	0.5	1.0	69	0.2	0.1	0.7	1.9	0.3
Plt & Sht; T-L	M7GQ12AB1	517	552	1320	973	1.0	1.0	0.218E-9	2.412	0.5	1.0	69	0.2	0.1	0.7	1.9	0.3
7050-T76511																	
Extr; L-T; LA & HHA	M7GS31AB1	545	600	1425	1042	1.0	1.0	0.329E-9	2.329	0.5	1.0	69	0.2	0.1	0.7	1.9	0.3
Extr; T-L	M7GS32AB1	545	600	1112	834	1.0	1.0	0.329E-9	2.329	0.5	1.0	69	0.2	0.1	0.7	1.9	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[M] 1000-9000 Series aluminum																	
7000 Series																	
7075-T6																	
Plt, Sht & Clad; L-T & T-L; LA	M7HA13AB1	517	579	1286	938	1.0	1.0	0.153E-10	2.947	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt, Sht & Clad; L-T & T-L; HHA	M7HA13AD1	517	579	1286	938	1.0	1.0	0.523E-9	2.497	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T651																	
Plt & Sht; L-T; LA, DA	M7HB11AB1	524	586	1320	973	1.0	1.0	0.212E-10	2.885	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; L-T; HHA	M7HB11AD1	524	586	1320	973	1.0	1.0	0.270E-12	3.985	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; L-T; 3.5% NaCl	M7HB11WB1	524	586	1320	973	1.0	1.0	0.442E-8	2.135	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L; DW	M7HB13WA1	524	586	1112	834	1.0	1.0	0.539E-8	1.917	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; S-T	M7HB15AB1	455	517	799	625	1.0	1.0	0.260E-9	2.435	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T6510																	
Extr; L-T; LA & DA	M7HC31AB1	545	607	1320	973	1.0	1.0	0.616E-8	1.869	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T6511																	

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Extr; L-T; LA & HHA	M7HD31AB1	552	600	1320	973	1.0	1.0	0.406E-9	2.324	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Extr; T-L	M7HD32AB1	552	600	1112	834	1.0	1.0	0.406E-9	2.324	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T73																	
Plt & Sht; L-T; LA, DA, HHA	M7HG11AB1	414	510	1737	973	1.0	1.0	0.289E-11	3.321	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L	M7HG12AB1	421	490	1112	799	1.0	1.0	0.211E-10	2.908	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T7351																	
Plt & Sht; L-T	M7HH11AB1	427	490	1425	1008	1.0	1.0	0.112E-9	2.529	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; L-T; DA	M7HH11AC1	427	490	1425	1008	1.0	1.0	0.742E-11	2.994	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; L-T; HHA	M7HH11AD1	427	490	1425	1008	1.0	1.0	0.336E-12	3.696	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L; LA & DA	M7HH12AB1	414	490	1216	869	1.0	1.0	0.100E-9	2.600	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; S-T; LA	M7HH15AB1	400	448	869	660	1.0	1.0	0.145E-9	2.300	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T73510																	
Extr; L-T; LA	M7HI31AB1	441	517	1494	1042	1.0	1.0	0.388E-8	1.918	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T73511																	
Extr; L-T; LA, DA, HHA	M7HJ31AB1	448	510	1598	1147	1.0	1.0	0.120E-9	2.508	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T7352																	
Plt, Sht & Forg; L-T; LA & DA	M7HK11AB1	407	469	1598	1147	1.0	1.0	0.637E-11	3.100	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3

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Plt, Sht & Forg; T-L; LA & DA	M7HK12AB1	365	469	1216	869	1.0	1.0	0.637E-11	3.100	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7075-T7651																	
Plt & Sht; L-T; LA & DA	M7HM11AB1	455	524	1564	1112	1.0	1.0	0.394E-9	2.305	0.5	1.0	83	1.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L; LA & DA	M7HM12AB1	455	517	1112	799	1.0	1.0	0.119E-11	3.338	0.5	1.0	83	1.0	0.1	0.7	1.9	0.3
7079-T651																	
Plt & Sht; L-T	M7IC11AB1	517	572	1251	903	1.0	1.0	0.312E-8	2.101	0.5	1.0	69	0.5	0.1	0.7	1.9	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

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Material; Condition; Environment*	Code	YS	UTS	K _{Ic}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[M] 1000-9000 Series aluminum																	
<u>7000 Series</u>																	
7149-T73511																	
Extr; L-T; LA	M7NA31AB1	455	524	1494	1077	1.0	1.0	0.295E-7	1.544	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Extr; T-L; LA	M7NA32AB1	434	510	1147	834	1.0	1.0	0.55E-7	1.435	0.5	1.0	104	2.0	0.1	0.7	1.9	1.3
7178-T6 & T651																	
Plt & Sht; L-T; LA & HHA	M7RA11AB1	579	614	1077	834	1.0	1.0	0.173E-8	2.180	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L; LA & HHA	M7RA12AB1	545	614	938	730	1.0	1.0	0.458E-9	2.400	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7178-T7651																	
Plt & Sht; L-T	M7RF11AB1	496	552	1355	973	1.0	1.0	0.599E-8	1.800	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L	M7RF12AB1	483	545	1077	799	1.0	1.0	0.599E-8	1.800	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7475-T61																	
Plt, Sht, Clad; L-T; LA, DA, HHA	M7TB11AB1	510	538	1494	1077	1.0	1.0	0.894E-9	2.211	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
Plt, Sht, Clad; T-L; LA, DA, HHA	M7TB12AB1	490	538	1251	903	1.0	1.0	0.453E-7	1.496	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3

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7475-T651																	
Plt & Sht; L-T; LA, DA, HHA	M7TD11AB1	517	586	1807	1286	1.0	1.0	0.152E-8	2.328	0.5	1.0	104	2.0	0.1	0.7	1.9	0.3
7475-T7351																	
Plt & Sht; L-T; LA, DA, HHA, DW	M7TF11AB1	434	503	2085	1494	1.0	1.0	0.164E-10	2.877	0.5	1.0	97	2.0	0.1	0.7	1.9	0.3
Plt & Sht; T-L; LA, DA, HHA	M7TF12AB1	393	483	1703	1216	1.0	1.0	0.690E-9	2.212	0.5	1.0	97	2.0	0.1	0.7	1.9	0.3
7475-T7651																	
Plt & Sht; L-T; LA, DA, HHA, DW, 3.5%NaCl	M7TJ11AB1	476	538	1946	1390	1.0	1.0	0.217E-10	2.808	0.5	1.0	76	2.0	0.1	0.7	1.9	0.3
[O] Misc. and cast aluminum																	
<u>300 Series cast</u>																	
A356-T60																	
Cast	O3FB50AB1	214	276	764	556	1.0	1.0	0.764E-16	4.980	0.5	1.0	226	1.8	0.1	0.7	1.9	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

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Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C _{th} ⁺	C _{th} ⁻	R _{cl}	α	S.R.
[P] Titanium alloys																	
<u>Ti Unalloyed</u>																	
Ti-55																	
Plt & Sht	P1AA13AB1	379	448	2432	1737	1.0	0.5	0.305E-13	3.670	0.5	0.5	174	2.5	0.1	0.7	2.5	0.3
Plt & Sht; DW & SW	P1AA13WA1	379	448	2432	1737	1.0	0.5	0.562E-13	3.670	0.5	0.5	174	2.5	0.1	0.7	2.5	0.3
Ti-70																	
Plt & Sht	P1CA13AB1	483	552	2432	1737	1.0	0.5	0.671E-12	3.180	0.5	0.5	174	2.0	0.1	0.7	2.5	0.3
Plt & Sht; DW & SW	P1CA13WA1	483	552	2432	1737	1.0	0.5	0.959E-12	3.180	0.5	0.5	174	2.0	0.1	0.7	2.5	0.3
<u>Binary Alloys</u>																	
Ti-2.5 Cu; STA																	
Sht; LA, HHA, DW	P2AA13AB1	669	758	2432	1737	1.0	0.5	0.110E-10	2.750	0.5	0.5	174	1.5	0.1	0.7	2.5	0.3
<u>Ternary Alloys</u>																	
Ti-5Al-2.5Sn; Annealed																	
Sht; LA, HHA, DW	P3CA13AB1	827	896	3127	2259	1.0	1.0	0.428E-10	2.500	0.5	0.5	174	1.5	0.1	0.4	2.5	0.3

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Ti-5Al-2.5Sn (ELI); Annealed																	
Forg	P3CB23AB1	793	827	3127	2259	1.0	1.0	0.225E-10	2.600	0.5	0.5	174	1.5	0.1	0.4	2.5	0.3
Forg; -253C LH2	P3CB23LA3	1379	1448	2780	2085	1.0	0.5	0.155E-11	2.850	0.5	0.5	174	1.5	0.1	0.4	2.5	0.3
Ti-3Al-2.5V; CW, SR(399C)																	
Extr	P3DB33AB1	724	862	2432	1737	1.0	0.5	0.523E-14	4.000	0.25	0.75	156	1.5	0.1	0.7	2.5	0.3
Ti-6Al-4V (MA)																	
Plt & Sht, -73C	P3EA13AA7	1138	1172	2259	1737	1.0	0.5	0.209E-12	3.300	0.25	0.75	122	1.8	0.1	0.7	2.5	0.3
Plt & Sht	P3EA13AB1	951	1007	2259	1737	1.0	0.5	0.147E-11	3.010	0.25	0.75	122	1.8	0.1	0.7	2.5	0.3
Forg	P3EA23AB1	931	1000	2259	1737	1.0	0.5	0.177E-13	3.667	0.25	0.75	122	1.8	0.1	0.7	2.5	0.3
Extr	P3EA33AB1	862	965	2606	2085	1.0	0.5	0.462E-14	3.834	0.25	0.75	174	1.8	0.1	0.7	2.5	0.3
Ti-6Al-4V; BA(1038C/5h + 718C/2h)																	
Plt & Sht; LA, DA, 3.5% NaCl	P3EB12AB1	827	931	3475	2780	1.0	0.5	0.224E-12	3.250	0.25	0.75	122	1.5	0.1	0.7	2.5	0.3
Forg; LA, DA, HHA, 3.5% NaCl	P3EB23AB1	758	862	3475	2780	1.0	0.5	0.150E-12	3.250	0.25	0.75	208	1.5	0.1	0.7	2.5	0.3
Ti-6Al-4V; RA																	
Sht; L-T; LA,DA,HHA,DW, 3.5% NaCl	P3EC11AB1	965	1034	2780	2085	1.0	0.5	0.313E-12	3.300	0.25	0.75	122	0.3	0.1	0.7	2.5	0.3
Sht; T-L; LA,DA,HHA,DW, 3.5% NaCl	P3EC12AB1	965	1034	2780	2085	1.0	0.5	0.522E-12	3.300	0.25	0.75	122	0.3	0.1	0.7	2.5	0.3

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Plt; -73C	P3EC13AA7	1103	1207	2953	2259	1.0	0.5	0.103E-14	4.200	0.50	0.75	174	0.3	0.1	0.7	2.5	0.3
Plt; LA, DA, HHA, DW	P3EC13AB1	862	931	3475	2606	1.0	0.5	0.151E-11	3.000	0.50	0.75	208	0.3	0.1	0.7	2.5	0.3
Forg; LA, DA, HHA, 3.5% NaCl	P3EC23AB1	793	896	3475	2606	1.0	0.5	0.104E-12	3.300	0.50	0.75	278	0.3	0.1	0.7	2.5	0.3
Ti-6Al-4V; ST(954C) + A(538C/4h)																	
Plt & Sht; SR(538C/4h)	P3ED13AA1	1069	1151	1911	1564	0.5	1.0	0.515E-11	2.850	0.25	0.75	122	1.5	0.1	0.5	2.5	0.3
Plt & Sht; SR(538C/8h)	P3ED13AB1	965	1034	1911	1564	0.5	1.0	0.121E-11	3.000	0.25	0.75	122	1.5	0.1	0.5	2.5	0.3
Plt & Sht; SR(538C/4h); -196C LN2	P3ED13LA4	1586	1655	1529	1320	1.0	0.5	0.588E-11	2.750	0.25	0.75	122	1.5	0.1	0.5	2.5	0.3
Forg; SR(538C/4h)	P3ED20AB1	1034	1124	1737	1459	0.75	0.75	0.447E-12	3.200	0.25	0.75	122	1.5	0.1	0.5	2.5	0.3
Forg; SR(538C/4h); -196C LN2	P3ED20LA4	1551	1620	1633	1390	0.5	0.75	0.459E-13	3.300	0.25	0.75	122	1.5	0.1	0.5	2.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

Material; Condition; Environment*	Code	YS	UTS	K _{Ic}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.	
[P] Titanium alloys																		
GTA Weld; SR; thk < 5.1mm	P3EDB2AB1A	862	931	1737	1390	1.0	0.5	0.215E-10	2.580	0.25	0.25	122	1.5	0.1	0.7	2.5	0.3	
GTA Weld; SR; thk >= 5.1mm	P3EDB2AB1B	862	931	2432	1911	1.0	0.5	0.215E-10	2.580	0.25	0.25	122	1.5	0.1	0.7	2.5	0.3	
Ti-6Al-4V; ELI; BA(1038C/5h) + 718C/2h)																		
Plt & sht; LA, 3.5% NaCl	P3EL12AB1	793	876	3475	2780	1.0	0.5	0.224E-12	3.250	0.25	0.75	122	1.5	0.1	0.7	2.5	0.3	
Ti-6Al-4V (ELI) RA																		
Plt	P3EM13AB1	827	896	3301	2606	1.0	0.5	0.151E-11	3.000	0.50	0.75	208	0.3	0.1	0.7	2.5	0.3	
Forg; -73C	P3EM23AA7	1000	1069	3301	2606	1.0	0.5	0.919E-13	3.300	0.50	0.75	208	0.3	0.1	0.7	2.5	0.3	
Forg	P3EM23AB1	827	896	3301	2606	1.0	0.5	0.910E-12	3.000	0.50	0.75	278	0.3	0.1	0.7	2.5	0.3	
Forg; -269C LHe	P3EM23LA2	1655	1710	2085	1737	1.0	0.5	0.177E-13	3.800	0.50	0.50	174	0.3	0.1	0.7	2.5	0.3	
Forg; -196C LN2	P3EM23LA4	1379	1469	2259	1911	1.0	0.5	0.849E-12	3.000	0.50	0.50	208	0.3	0.1	0.7	2.5	0.3	
Forg; EB welded, SR; weldline	P3EMD2AB1	827	896	3127	2259	1.0	0.5	0.210E-9	2.000	0.50	0.75	174	0.3	0.1	0.7	2.5	0.3	
Forg; EB welded, SR; weldline; -196C LN2	P3EMD2LA4	1379	1469	2259	1911	1.0	0.5	0.168E-9	2.000	0.50	0.50	174	0.3	0.1	0.7	2.5	0.3	
Forg; EB welded, SR; HAZ	P3EMD8AB1	827	896	3127	2259	1.0	0.5	0.252E-9	2.000	0.50	0.75	174	0.3	0.1	0.7	2.5	0.3	

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STA(965-1100UTS, 2432KIc) Plt & Forg	P4MD23AB1	965	1034	3301	2432	1.0	0.5	0.428E-10	2.500	0.25	0.25	69	1.5	0.1	0.7	2.5	0.3
STA(1100-1240UTS, 2085KIc) Plt & Forg	P4MF23AB1	1055	1172	2780	2085	1.0	0.5	0.714E-10	2.500	0.25	0.25	69	1.5	0.1	0.7	2.5	0.3
STA(1240-1380UTS, 1390KIc) Plt & Forg	P4MG13AB1	1227	1310	1668	1390	1.0	0.5	0.714E-10	2.500	0.25	0.25	69	1.5	0.1	0.7	2.5	0.3
STA(1240-1380 UTS, 1042KIc) Plt & Forg	P4MG20AB1	1227	1310	1216	1042	1.0	0.5	0.714E-10	2.500	0.25	0.25	69	1.5	0.1	0.7	2.5	0.3
STA(1240-1380 UTS, 869KIc) Forg	P4MG23AB1	1227	1310	973	869	1.0	0.5	0.107E-9	2.500	0.25	0.25	69	1.5	0.1	0.7	2.5	0.3
Ti-6Al-2Zn-2Sn-2Mo-2Cr (ST or STA)																	
Plt; HHA	P5FB11AD1	1069	1138	2606	1911	1.0	0.5	0.446E-10	2.500	0.25	0.75	122	1.5	0.1	0.7	2.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

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Material; Condition; Environment*	Code	YS	UTS	K _{Ic}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{ct}	α	S.R.
[Q] Ni alloys/superalloys																	
<u>Hastelloy Alloys</u>																	
Hastelloy B																	
Rnd Rod	Q1AA16AB1	414	876	9277	3475	1.0	0.5	0.507E-13	3.200	0.50	0.50	695	1.5	0.1	0.6	2.5	0.3
Hastelloy X-280; ST(1177C)																	
Plt; 316-427C Air	Q1QA10AA15	269	627	5212	3822	0.75	0.5	0.180E-13	3.600	0.50	0.50	208	1.5	0.1	0.7	2.5	0.3
Plt; 538-649C Air; >.67Hz	Q1QA10AA19	228	579	4865	3475	0.75	0.5	0.288E-13	3.600	0.50	0.50	208	1.5	0.1	0.7	2.5	0.3
Plt	Q1QA10AB1	365	752	5733	4170	0.75	0.5	0.720E-14	3.600	0.50	0.50	278	1.5	0.1	0.7	2.5	0.3
<u>Inconel Alloys</u>																	
Inconel 600																	
Plt & Sht; 538C	Q3AB10AA18	193	572	4865	3475	1.0	0.5	0.940E-13	3.300	0.50	0.50	174	1.0	0.1	0.7	2.5	0.3
Plt & Sht; 24-427C	Q3AB10AB1	241	648	4865	3475	1.0	0.5	0.115E-16	4.647	0.50	0.50	278	1.5	0.1	0.7	2.5	0.3
Inconel 625																	
Plt & Sht; 316C	Q3EA10AA14	345	841	4343	3127	1.0	0.5	0.543E-15	4.124	0.50	0.50	174	0.2	0.1	0.7	2.5	0.3

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Plt & Sht; 427C	Q3EA10AA16	331	820	4343	3127	1.0	0.5	0.103E-12	3.365	0.50	0.50	139	1.0	0.1	0.7	2.5	0.3	
Plt & Sht; 538C	Q3EA10AA18	331	820	4343	3127	1.0	0.5	0.602E-11	2.792	0.50	0.50	86	0.2	0.1	0.7	2.5	0.3	
Plt & Sht;	Q3EA10AB1	455	917	4865	3475	1.0	0.5	0.411E-14	3.745	0.50	0.50	174	1.0	0.1	0.7	2.5	0.3	
Inconel 706; ST(982-1066C); A(746C/8h; 621C/5-8h)																		
Forg & Extr	Q3JB33AB1	1000	1220	4170	2953	0.75	0.5	0.163E-12	3.069	0.50	0.50	417	2.0	0.1	0.65	2.5	0.3	
Forg & Extr; -269C Lhe	Q3JB33LA2	1220	1586	5108	3648	0.75	0.5	0.189E-10	2.144	0.50	0.50	556	0.5	0.1	0.30	2.94	0.34	
ST Plt - GTA weld - STA	Q3JBB3AB1	1000	1131	1911	1564	0.75	0.5	0.237E-12	3.069	0.50	0.50	208	1.5	0.1	0.65	2.5	0.3	
ST Plt - GTA weld - STA; -269C Lhe	Q3JBB3LA2	1220	1469	2259	1737	0.75	0.5	0.269E-14	3.457	0.50	0.50	278	1.5	0.1	0.30	2.94	0.34	
Inconel 718; ST(927-1010C) + A(718C/8h + 621C/10h)																		
Plt; 316C air, >.3Hz	Q3LB11AA14	1034	1310	4343	3127	0.75	0.5	0.828E-13	3.250	0.25	0.50	260	2.0	0.1	0.7	2.5	0.3	
Plt; 427C air, >.3Hz	Q3LB11AA16	979	1241	4170	2953	0.75	0.5	0.395E-13	3.395	0.25	0.50	260	2.0	0.1	0.7	2.5	0.3	
Plt; 538C air, >.3Hz	Q3LB13AA18	931	1227	3301	2432	0.75	0.5	0.282E-11	2.775	0.25	0.50	243	1.7	0.1	0.7	2.5	0.3	
Sht (t<.25")	Q3LB13AB1A	1207	1448	4170	2953	0.75	0.5	0.561E-13	3.250	0.25	0.50	278	3.0	0.1	0.7	2.5	0.3	
Plt	Q3LB13AB1B	1172	1379	4343	3127	0.75	0.5	0.561E-13	3.250	0.25	0.50	278	3.0	0.1	0.7	2.5	0.3	
Forg	Q3LB23AB1	1138	1310	4343	3127	0.75	0.5	0.527E-13	3.295	0.25	0.50	208	1.0	0.1	0.7	2.5	0.3	
Forg; 149C air, >.3Hz	Q3LB26AA10	1103	1289	4343	3127	0.75	0.5	0.411E-14	3.500	0.25	0.50	208	1.5	0.1	0.7	2.5	0.3	

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Forg; 316C air, >.3Hz	Q3LB26AA14	1069	1276	4343	3127	0.75	0.5	0.212E-13	3.425	0.25	0.50	191	1.5	0.1	0.7	2.5	0.3
Forg; 427C air, >.3Hz	Q3LB26AA16	1014	1193	4170	2953	0.75	0.5	0.106E-12	3.216	0.25	0.50	191	1.5	0.1	0.7	2.5	0.3
Forg; 538C air, >.3Hz	Q3LB26AA18	965	1151	3301	2432	0.75	0.5	0.489E-11	2.747	0.25	0.50	174	1.5	0.1	0.7	2.5	0.3
GTA weld-STA; 316C air, >.6Hz	Q3LBB3AA14	965	1172	2953	2085	0.75	0.5	0.180E-13	3.536	0.25	0.50	208	1.5	0.1	0.7	2.5	0.3
GTA weld-STA; 427C air, >.6Hz	Q3LBB3AA16	931	1103	2606	1911	0.75	0.5	0.260E-12	3.108	0.25	0.50	191	1.5	0.1	0.7	2.5	0.3
GTA weld-STA; 538C air, >.6Hz	Q3LBB3AA18	910	1103	2085	1564	0.75	0.5	0.309E-12	3.165	0.25	0.50	174	1.5	0.1	0.7	2.5	0.3
ST plt-GTA weld-aged	Q3LBB3AB1	1103	1324	2432	1911	0.75	0.5	0.804E-15	3.954	0.25	0.50	225	1.5	0.1	0.7	2.5	0.3
ST plt-GTA weld-aged; -196C LN2	Q3LBB3LA4	1227	1565	2432	1911	0.75	0.5	0.804E-15	3.954	0.25	0.50	225	1.5	0.1	0.7	2.5	0.3
ST plt-EB weld-aged	Q3LBD3AB1	1124	1413	1911	1564	0.75	0.5	0.328E-14	3.846	0.25	0.50	225	1.5	0.1	0.7	2.5	0.3
ST plt-EB weld-aged; -196C LN2	Q3LBD3LA4	1331	1544	1737	1390	0.75	0.5	0.328E-14	3.846	0.25	0.50	225	1.5	0.1	0.7	2.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

4For C_{th} calculation only (by-pass of closure for da/dN)

Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	ΔK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.	
[Q] Ni alloys/superalloys																		
Inconel 718; ST(1038C) + A(760C/10h + 649C/10h)																		
Plt; -196C LN2	Q3LC10LA4	1317	1551	4343	3127	0.75	0.5	0.259E-12	2.900	0.25	0.50	278	2.0	0.1	0.7	2.5	0.3	
Plt; 316C air; >.6Hz	Q3LC11AA14	1089	1241	4343	3127	0.75	0.5	0.750E-13	3.234	0.25	0.50	261	2.0	0.1	0.7	2.5	0.3	
Plt	Q3LC11AB1	1138	1413	4343	3127	0.75	0.5	0.345E-12	2.900	0.25	0.50	278	3.0	0.1	0.7	2.5	0.3	
Plt; 538C air; >.6Hz	Q3LC12AA18	1000	1172	3475	2432	0.75	0.5	0.249E-11	2.829	0.25	0.50	243	1.7	0.1	0.7	2.5	0.3	
Inconel 718; ST(1093C) + A(718C/4h + 621C/16h)																		
Plt; 427C air; >.2Hz	Q3LE11AA16	917	1172	4170	2953	0.75	0.5	0.228E-11	2.733	0.25	0.50	261	2.0	0.1	0.7	2.5	0.3	
Plt; 538C air; >.6Hz	Q3LE13AA18	862	1082	3475	2432	0.75	0.5	0.432E-10	2.251	0.25	0.50	243	1.7	0.1	0.7	2.5	0.3	
Plt	Q3LE13AB1	1000	1289	4343	3127	0.75	0.5	0.216E-12	2.900	0.25	0.50	278	2.0	0.1	0.7	2.5	0.3	
GTA weld-STA; 316C air, >.6Hz	Q3LEB3AA14	965	1241	2953	2085	0.75	0.5	0.140E-10	2.386	0.25	0.50	208	1.5	0.1	0.7	2.5	0.3	
GTA weld-STA; 427C air, >.6Hz	Q3LEB3AA16	910	1207	2606	1911	0.75	0.5	0.110E-10	2.452	0.25	0.50	191	1.5	0.1	0.7	2.5	0.3	
GTA weld-STA; 538C air, >.6Hz	Q3LEB3AA18	889	1151	2432	1737	0.75	0.5	0.343E-9	1.984	0.25	0.50	174	1.5	0.1	0.7	2.5	0.3	
GTA weld-STA	Q3LEB3AB1	1014	1331	2953	2085	0.75	0.5	0.494E-12	2.844	0.25	0.50	226	1.5	0.1	0.7	2.5	0.3	

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Inconel 718, Bolt material																	
1280 MPa UTS Bolts	Q3LP18AB1	1241	1413	3475	2432	0.75	0.5	0.860E-14	3.626	0.25	0.50	139	0.5	0.1	0.7	2.5	0.3
1550 MPa UTS Bolts	Q3LQ18AB1	1413	1551	2432	1911	0.75	0.5	0.807E-12	2.838	0.25	0.50	104	0.5	0.1	0.7	2.5	0.3
Inconel X-750; ST(1149C) + A(843C/24h + 704C/20h)																	
Plt; 316C air, >.6Hz	Q3SD10AA14	600	1014	2432	1737	0.75	0.5	0.334E-14	3.705	0.25	0.50	208	1.5	0.1	0.7	2.5	0.3
Plt; 427C air, >.6Hz	Q3SD10AA16	572	986	2432	1737	0.75	0.5	0.596E-13	3.200	0.25	0.50	174	1.5	0.1	0.7	2.5	0.3
Plt; 538C air, >.6Hz	Q3SD10AA18	558	924	2432	1737	0.75	0.5	0.182E-11	2.727	0.25	0.50	139	0.5	0.1	0.7	2.5	0.3
Plt & Forg	Q3SD26AB1	689	1034	2953	2085	0.75	0.5	0.139E-13	3.421	0.25	0.50	347	2.5	0.1	0.7	2.5	0.3
Forg; -269C Lhe	Q3SD26LA2	862	1517	3475	2432	0.75	0.5	.383E-25	7.228	0.25	0.50	417	1.5	0.1	0.7	2.5	0.3
<u>Rene and Udimet Alloys</u>																	
Rene 41; ST(1066C) + A(760C/16h)																	
Plt & Forg	Q7AD13AB1	951	1269	3648	2606	0.75	0.5	0.918E-15	3.847	0.25	0.50	278	1.5	0.1	0.7	2.5	0.3
Forg; 593C air	Q7AD26AA19	772	1082	2919	2085	0.75	0.5	0.901E-13	3.384	0.25	0.50	208	1.5	0.1	0.7	2.5	0.3
Forg; 649C air	Q7AD26AA20	758	1069	2676	1911	0.75	0.5	0.309E-9	2.150	0.25	0.50	208	1.5	0.1	0.7	2.5	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

Material; Condition; Environment*	Code	YS	UTS	K _{Ie}	K _{Ic}	A _k	B _k	C	n	p	q	DK _O	C ⁺ _{th}	C ⁻ _{th}	R _{cl}	α	S.R.
[R] Misc. superalloys																	
<u>Multiphase alloys</u>																	
MP35N Rnd Rod	R3AB18AB1	1751	1889	3648	2780	1.0	0.5	0.206E-10	2.280	0.25	0.25	104	0.2	0.1	0.7	2.5	0.3
[S] Copper/Bronze alloys																	
<u>Be-Cu Alloys</u>																	
CDA 172																	
Rnd Rod	S0BA13AB1	1096	1234	938	903	0.35	0.5	0.112E-15	4.595	0.5	1.0	278	2.0	0.1	0.7	2.0	0.3
C17510																	
Peak-aged Pt	S1LB11AB1	758	862	3822	2606	1.0	0.5	0.791E-9	1.950	0.75	0.50	278	2.0	0.1	0.7	2.0	0.3
Peak-aged Pt; -196C LN2	S1LB11LA4	827	972	5212	3822	1.0	0.5	0.104E-10	2.591	0.75	0.50	278	2.0	0.1	0.7	2.0	0.3
Overaged Pt	S1LC11AB1	593	683	3648	2432	1.0	0.5	0.321E-10	2.500	0.75	0.50	278	2.0	0.1	0.7	2.0	0.3
<u>Al-Bronze Alloys</u>																	
CDA 630 Al-Bronze Extr	S6JB36AB1	565	807	2571	1842	1.0	0.5	0.379E-12	3.190	0.50	0.50	295	2.0	0.1	0.7	2.5	0.3
[T] Magnesium alloys																	

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AM 503 Plt	T1AA11AB1	110	200	591	417	1.0	0.5	0.962E-10	3.183	0.25	0.25	26	1.0	0.1	0.7	1.5	0.3
AZ-31B-H24 Plt	T1DA12AB1	179	269	973	695	1.0	0.5	0.486E-9	2.717	0.25	0.25	49	1.5	0.1	0.7	1.5	0.3
ZK-60A-T5 Plt	T1MA12AB1	269	345	973	695	1.0	0.5	0.796E-9	2.576	0.25	0.25	49	1.5	0.1	0.7	1.5	0.3
ZW1 Plt	T1NA11AB1	165	248	625	452	1.0	0.5	0.845E-10	3.210	0.25	0.25	26	1.0	0.1	0.7	1.5	0.3
QE22A-T6 Plt	T2LB13AB1	179	228	625	452	1.0	0.5	0.845E-10	3.210	0.25	0.25	26	1.0	0.1	0.7	1.5	0.3
[U] Misc. non-ferrous alloys																	
<u>Beryllium</u>																	
Cross-rolled sht	U1CA90AB1	379	483	382	313	1.0	1.5	0.846E-14	3.750	0.15	0.15	243	0.5	0.1	0.7	1.75	0.3
Hot-pressed blk	U1CA93AB1	241	414	434	347	1.0	1.5	0.251E-16	5.000	0.15	0.15	295	0.5	0.1	0.7	1.75	0.3
<u>Columbium Alloys</u>																	
C-103 Plt	U2CA10AB1	296	345	1459	1042	1.0	1.0	0.752E-10	2.322	0.5	0.5	347	0.5	0.1	0.7	2.0	0.3
<u>Zinc Alloys</u>																	
Zn-4Al-0.04Mg Die cast alloy No. 3																	
As cast; 57C-93C air	U4BA50AA9	172	234	695	486	1.0	0.5	0.156E-9	2.812	0.25	0.5	52	0.2	0.1	0.7	1.25	0.3
As cast	U4BA50AB1	207	283	695	486	1.0	0.5	0.253E-11	3.700	0.25	0.5	87	0.2	0.1	0.7	1.25	0.3

*Unless noted, assume Lab Air (LA) environment and any orientation except S-T, S-L, C-R, C-L, and R-L.

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