

明治大学学術フロンティア
信頼性データバンク疲労データシート

**Meiji University Academic Frontier
Reliability Data Bank Fatigue Data Sheet**

浸炭焼入れ鋼 SCM420H
両振りねじり疲労特性データシート

Data Sheet on Fatigue Properties of SCM420H Steel
for Alternating Torsion Life Test

2010年4月27日（火）

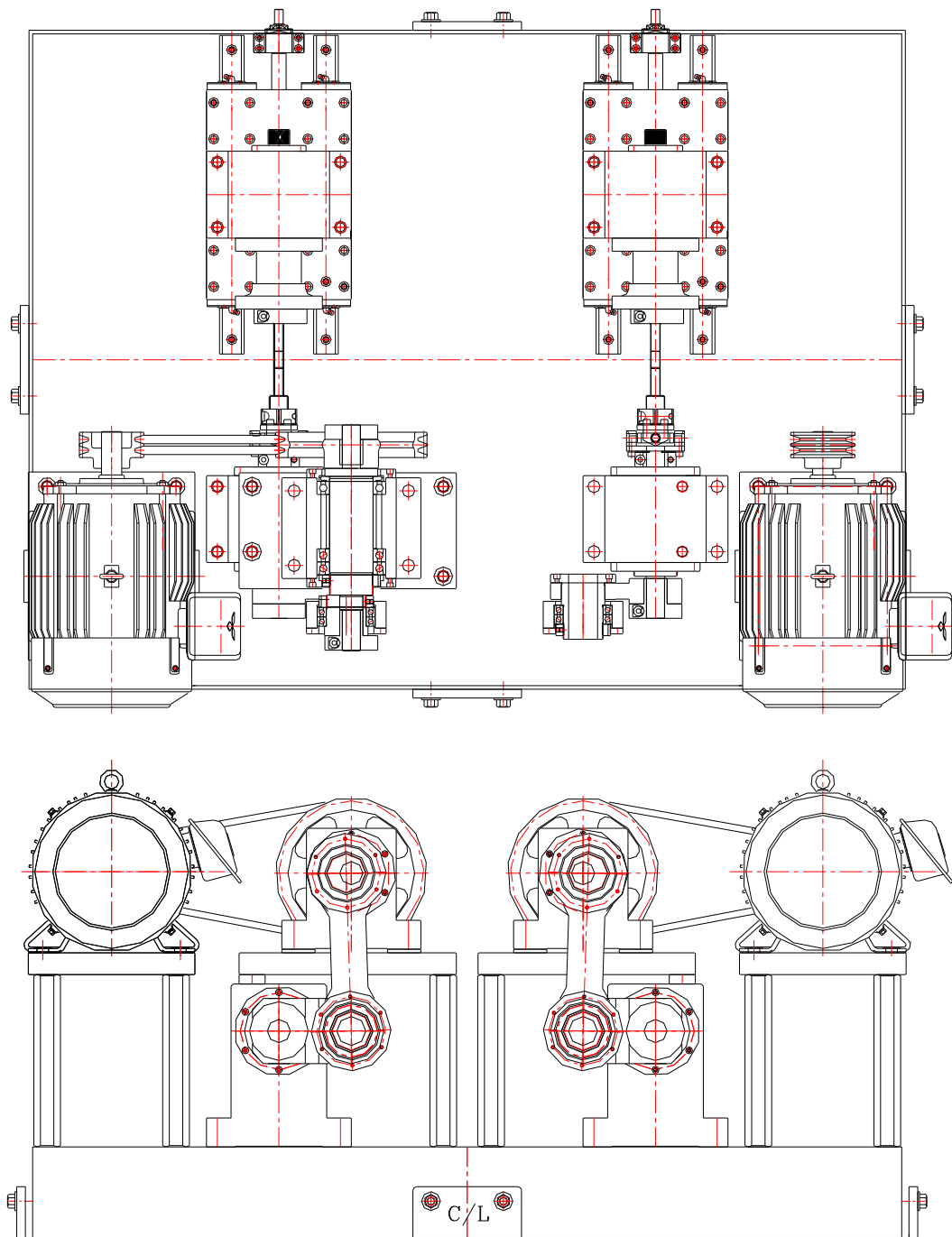


Fig.1 General view of alternating torsion life test rig



Fig.2 Alternating torsion life test rig

Table 1 Test specimen

Hardness	HRC 58-62
Geometry	

Table 2 Estimation parameters by log-normal distribution function

Stress[GPa]	0.93	0.85	0.74	0.70	0.64
μ	10.56	12.02	13.40	14.90	15.29
σ	0.41	0.40	0.49	0.59	0.59
δ	0.039	0.033	0.037	0.039	0.039

Table 3 Estimation parameters by two-parameter Weibull distribution function

Stress[GPa]	0.93	0.85	0.74	0.70	0.64
<i>m</i>	2.94	3.11	2.50	2.05	2.03
<i>η</i> 10 ⁵	0.47	1.97	8.21	38.6	57.2

Table 4 Estimation parameter by three-parameter Weibull distribution function

Stress[GPa]	0.93	0.85	0.74	0.70	0.64
<i>m</i>	1.5				
<i>η</i> 10 ⁵	0.35	1.42	6.70	34.7	51.5
<i>γ</i> 10 ⁵	0.14	0.64	1.85	5.16	7.44

Table 5 Number of stress cycles to failures by alternating torsion fatigue life test for SCM420H steel

No.	Stress τ_{\max} [GPa]						
	0.93	0.85	0.74	0.70	0.64	0.61	0.53
1	$2.10 \cdot 10^4$	$6.90 \cdot 10^4$	$2.35 \cdot 10^5$	$1.13 \cdot 10^6$	$1.71 \cdot 10^6$	$1.24 \cdot 10^7$	$5.83 \cdot 10^7$
2	$2.20 \cdot 10^4$	$9.80 \cdot 10^4$	$3.90 \cdot 10^5$	$1.24 \cdot 10^6$	$2.17 \cdot 10^6$	$1.77 \cdot 10^7$	$6.00 \cdot 10^7$
3	$2.20 \cdot 10^4$	$1.13 \cdot 10^5$	$4.00 \cdot 10^5$	$1.90 \cdot 10^6$	$2.18 \cdot 10^6$	$1.87 \cdot 10^7$	$1.85 \cdot 10^8$
4	$2.70 \cdot 10^4$	$1.18 \cdot 10^5$	$4.07 \cdot 10^5$	$1.99 \cdot 10^6$	$2.33 \cdot 10^6$	$2.01 \cdot 10^7$	
5	$3.10 \cdot 10^4$	$1.37 \cdot 10^5$	$4.63 \cdot 10^5$	$2.16 \cdot 10^6$	$2.72 \cdot 10^6$	$2.56 \cdot 10^7$	
6	$3.30 \cdot 10^4$	$1.40 \cdot 10^5$	$5.05 \cdot 10^5$	$2.20 \cdot 10^6$	$2.84 \cdot 10^6$	$2.88 \cdot 10^7$	
7	$3.30 \cdot 10^4$	$1.47 \cdot 10^5$	$5.19 \cdot 10^5$	$2.37 \cdot 10^6$	$3.19 \cdot 10^6$	$2.92 \cdot 10^7$	
8	$3.40 \cdot 10^4$	$1.47 \cdot 10^5$	$6.09 \cdot 10^5$	$2.41 \cdot 10^6$	$3.47 \cdot 10^6$		
9	$3.40 \cdot 10^4$	$1.65 \cdot 10^5$	$6.12 \cdot 10^5$	$2.60 \cdot 10^6$	$3.66 \cdot 10^6$		
10	$3.60 \cdot 10^4$	$1.67 \cdot 10^5$	$6.45 \cdot 10^5$	$2.93 \cdot 10^6$	$4.45 \cdot 10^6$		
11	$3.70 \cdot 10^4$	$1.74 \cdot 10^5$	$6.74 \cdot 10^5$	$2.99 \cdot 10^6$	$4.99 \cdot 10^6$		
12	$3.90 \cdot 10^4$	$1.74 \cdot 10^5$	$7.15 \cdot 10^5$	$3.38 \cdot 10^6$	$5.04 \cdot 10^6$		
13	$4.50 \cdot 10^4$	$1.75 \cdot 10^5$	$8.37 \cdot 10^5$	$3.96 \cdot 10^6$	$5.64 \cdot 10^6$		
14	$4.50 \cdot 10^4$	$1.86 \cdot 10^5$	$8.67 \cdot 10^5$	$4.20 \cdot 10^6$	$5.82 \cdot 10^6$		
15	$4.70 \cdot 10^4$	$2.05 \cdot 10^5$	$9.17 \cdot 10^5$	$5.22 \cdot 10^6$	$6.12 \cdot 10^6$		
16	$5.10 \cdot 10^4$	$2.05 \cdot 10^5$	$9.67 \cdot 10^5$	$5.85 \cdot 10^6$	$6.78 \cdot 10^6$		
17	$5.60 \cdot 10^4$	$2.18 \cdot 10^5$	$1.02 \cdot 10^6$	$6.80 \cdot 10^6$	$7.01 \cdot 10^6$		
18	$6.40 \cdot 10^4$	$2.84 \cdot 10^5$	$1.03 \cdot 10^6$	$8.26 \cdot 10^6$	$8.56 \cdot 10^6$		
19	$7.60 \cdot 10^4$	$3.00 \cdot 10^5$	$1.03 \cdot 10^6$		$8.81 \cdot 10^6$		
20	$7.70 \cdot 10^4$	$3.06 \cdot 10^5$	$1.71 \cdot 10^6$		$1.40 \cdot 10^7$		

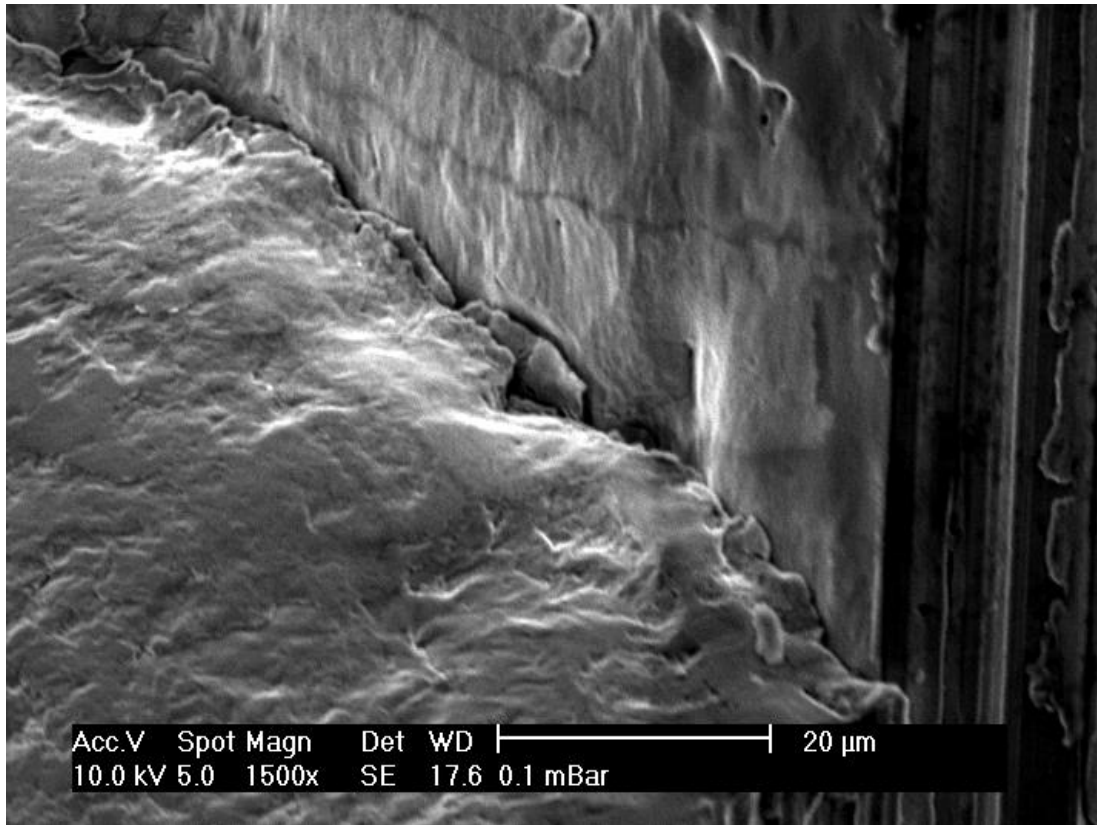


Fig.3 Initiation point by surface shearing stress of test piece

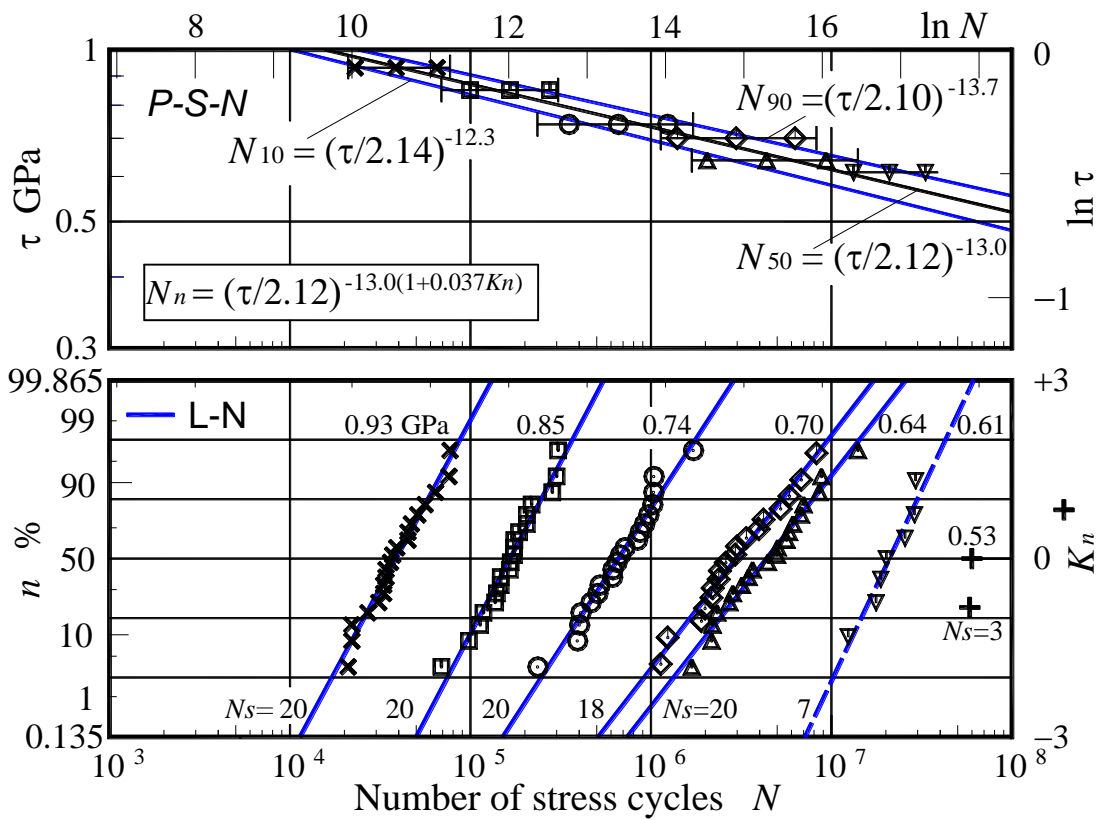


Fig.3 Life distribution and lognormal-based *P-S-N* curve for alternating torsion test, SCM420H steel

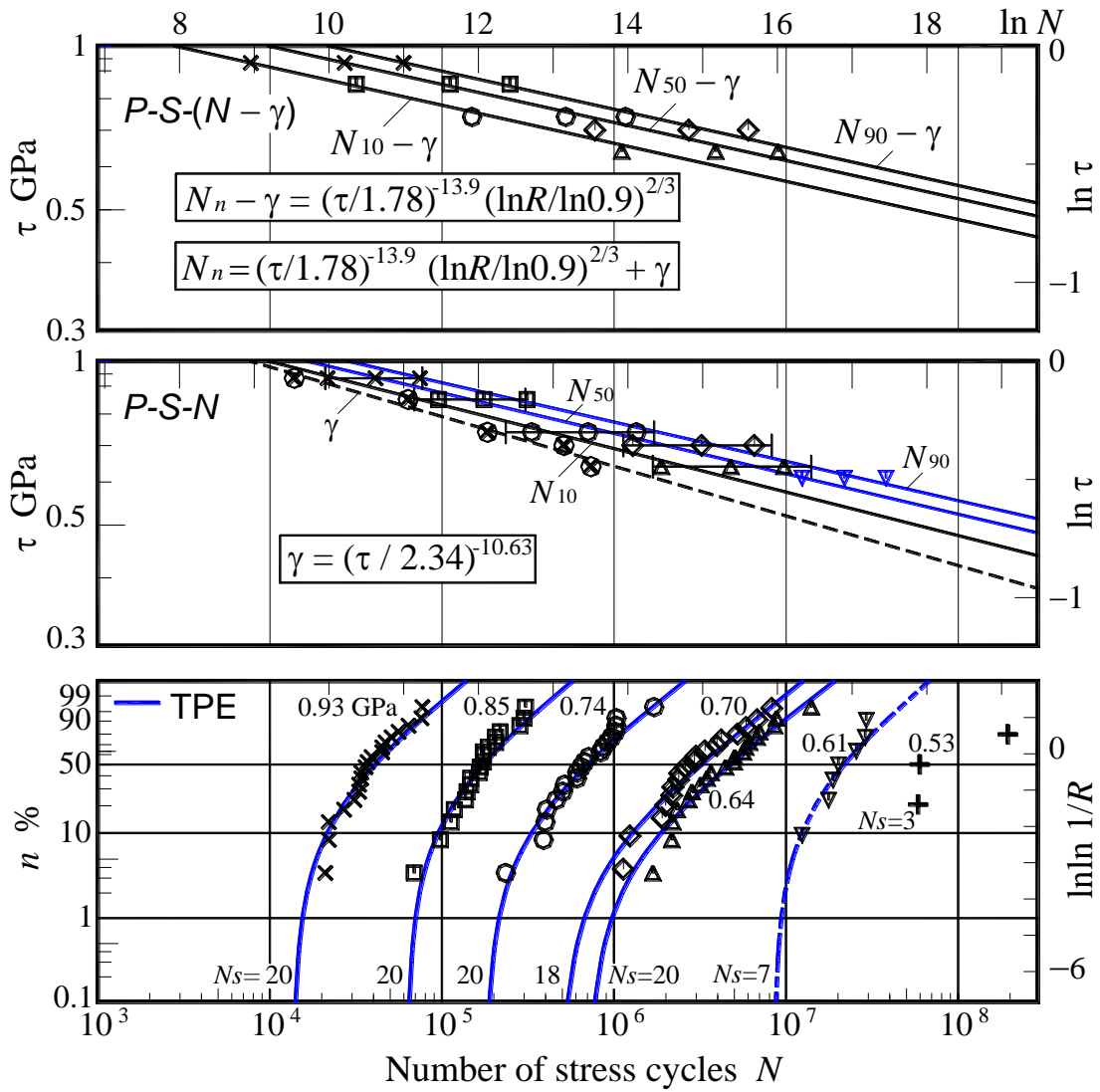


Fig.4 Life distribution and Weibull plot, and three-parameter Weibull-based $P-S-N$ curve with $m = 3/2$ for alternating torsion test, SCM420H steel

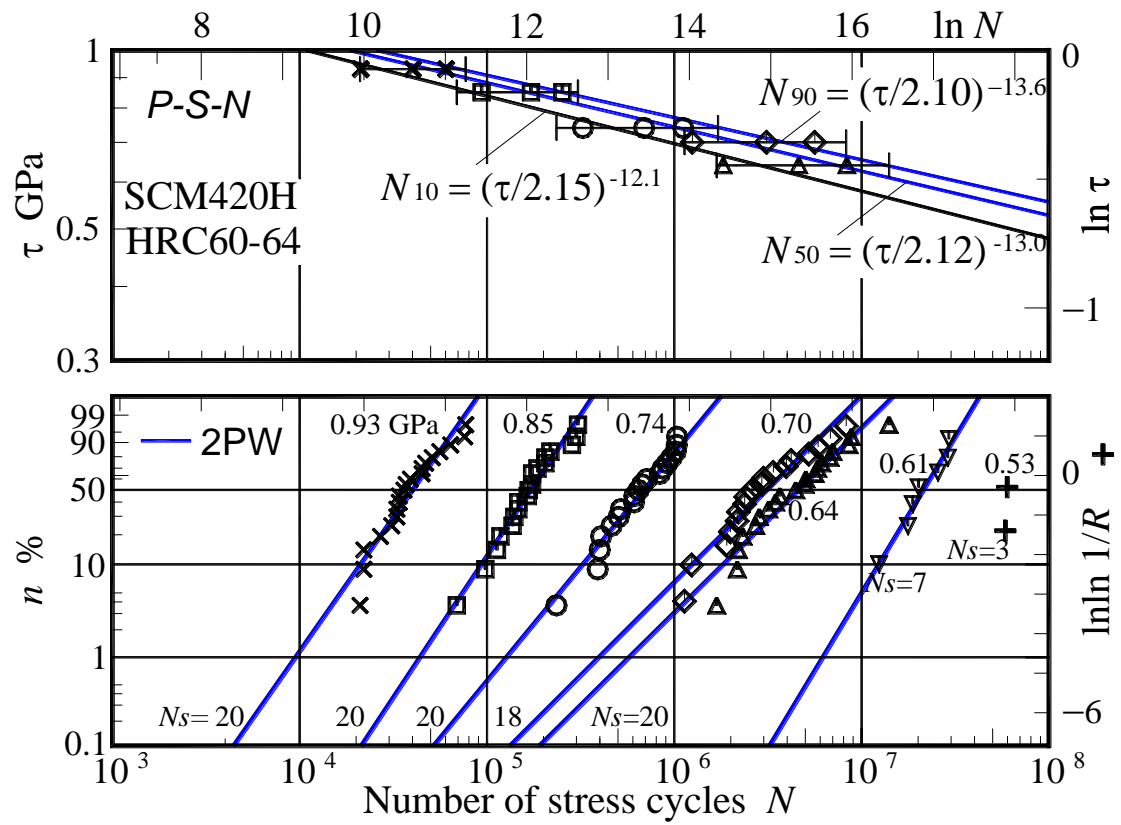


Fig.5 Life distribution and Weibull plot, and two-parameter Weibull-based $P-S-N$ curve for alternating torsion test, SCM420H steel