

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**

深溝玉軸受寿命データシート

Data Sheet on Fatigue Life Test
for Deep Groove Ball Bearings

Project of Meiji University Academic Frontier

2010年4月27日(火)

Table 1 Life test data for deep groove ball bearing ($F_r=9.14\text{kN}, \phi 62\text{H}6$)

No	Total revolutions [x10 ⁶ rpm]	Broken place	i	N_i	MON_j
1	10.131	Outer ring	1	0	1.00
2	19.516	Outer ring	2	0	2.00
3	26.459	Outer ring	3	0	3.00
4	34.144	Ball	4	0	4.00
5	37.313	Outer ring	5	0	5.00
6	41.370	None	-	-	-
7	47.119	Outer ring	6	1.04	6.04
8	55.019	Outer ring	7	1.04	7.08
9	67.701	Outer ring	8	1.04	8.12
10	74.965	Outer ring	9	1.04	9.16
11	75.405	Ball	10	1.04	10.20
12	80.037	Ball	11	1.04	11.24
13	85.909	None	-	-	-
14	85.392	Outer ring	12	1.10	12.34
15	94.122	Outer ring	13	1.10	13.44
16	116.285	Outer ring	14	1.10	14.54
17	122.473	None	-	-	-
18	122.613	Outer ring	15	1.18	15.72
19	126.271	Outer ring	16	1.18	16.90
20	134.964	None	-	-	-
21	197.432	Outer ring	17	1.28	18.18
22	200.512	Ball	18	1.28	19.46
23	202.232	None	-	-	-
24	220.314	Outer ring	19	1.44	20.90
25	261.872	Outer ring	20	1.44	22.34
26	262.084	Outer ring	21	1.44	23.78
27	277.394	Outer ring	22	1.44	25.22
28	349.367	Outer ring	23	1.44	26.66
29	400.762	Outer ring	24	1.44	28.10
30	449.187	Outer ring	25	1.44	29.54

Table 2 Life test data for deep groove ball bearing ($F_r=10.64\text{kN}, \phi 62\text{H}6$)

No	Total revolutions [x10 ⁶ rpm]	Broken place	i	N_i	MON_j
1	6.961	Outer ring	1	0	1.00
2	13.711	Outer ring	2	0	2.00
3	19.903	Outer ring	3	0	3.00
4	22.613	Outer ring	4	0	4.00
5	26.615	None	-	-	-
6	28.095	Outer ring	5	1.04	5.04
7	31.553	Outer ring	6	1.04	6.08
8	35.965	None	-	-	-
9	36.253	Outer ring	7	1.09	7.17
10	39.077	Ball	8	1.09	8.26
11	40.270	Outer ring	9	1.09	9.35
12	42.532	Ball	10	1.09	10.44
13	43.182	Outer ring	11	1.09	11.53
14	48.899	Outer ring	12	1.09	12.62
15	56.196	None	-	-	-
16	65.861	Ball	13	1.16	13.78
17	68.258	Outer ring	14	1.16	14.94
18	80.265	Outer ring	15	1.16	16.10
19	88.763	Outer ring	16	1.16	17.26
20	90.026	Outer ring	17	1.16	18.42
21	96.983	None	-	-	-
22	103.534	Outer ring	18	1.29	19.71
23	104.139	Outer ring	19	1.29	21.00
24	123.449	Outer ring	20	1.29	22.29
25	124.244	Outer ring	21	1.29	23.58
26	156.714	Outer ring	22	1.29	24.87
27	193.016	Outer ring	23	1.29	26.16
28	247.208	Outer ring	24	1.29	27.45
29	375.372	Outer ring	25	1.29	28.74

Table 3 Life test data for deep groove ball bearing ($F_r=12.13\text{kN}, \phi 62\text{H}6$)

No	Total revolutions [x10 ⁶ rpm]	Broken place	i	N_i	MON_j
1	5.874	Outer ring	1	0	1.00
2	6.366	Outer ring	2	0	2.00
3	6.389	Outer ring	3	0	3.00
4	7.681	Ball	4	0	4.00
5	10.816	Outer ring	5	0	5.00
6	13.316	Outer ring	6	0	6.00
7	13.911	Ball	7	0	7.00
8	16.857	None	-	-	-
9	17.690	Outer ring	8	1.04	8.04
10	19.367	Outer ring	9	1.04	9.08
11	19.692	Outer ring	10	1.04	10.12
12	20.917	Outer ring	11	1.04	11.16
13	21.636	Outer ring	12	1.04	12.20
14	22.036	Outer ring	13	1.04	13.24
15	23.135	Outer ring	14	1.04	14.28
16	25.402	Inner ring	15	1.04	15.32
17	37.517	Ball	16	1.04	17.40
18	46.073	Outer ring	17	1.04	18.44
19	47.723	Ball	18	1.04	19.48
20	49.749	Outer ring	19	1.04	20.52
21	50.777	None	-	-	-
22	52.213	Outer ring	20	1.05	21.57
23	62.512	Outer ring	21	1.05	22.62
24	63.176	None	-	-	-
25	65.403	None	-	-	-
26	66.566	Outer ring	22	1.40	24.02
27	67.286	Outer ring	23	1.40	25.42
28	73.575	Outer ring	24	1.40	26.82
29	76.430	Outer ring	25	1.40	28.22
30	104.691	Outer ring	26	1.40	29.62

Table 4 Life test data for deep groove ball bearing that used new housing

($F_r=10.64\text{kN}, \phi 62_{-0.018}^{-0.002}$)

No	Total revolutions [x10 ⁶ rpm]	Broken place	i	N_i	MON_j
1	54.035	Outer ring	1	0	1.00
2	69.583	Inner ring	2	0	2.00
3	106.444	Inner ring	3	0	3.00
4	108.376	Outer ring	4	0	4.00
5	109.157	Outer ring	5	0	5.00
6	116.085	Outer ring	6	0	6.00
7	134.258	Outer ring	7	0	7.00
8	136.651	Outer ring	8	0	8.00
9	153.618	Outer ring	9	0	9.00
10	157.564	Outer ring	10	0	10.00
11	170.638	Outer ring	11	0	11.00
12	177.135	Outer ring	12	0	12.00
13	184.685	Ball	13	0	13.00
14	193.908	Outer ring	14	0	14.00
15	237.453	Outer ring	15	0	15.00
16	243.696	Outer ring	16	0	16.00
17	252.977	Outer ring	17	0	17.00
18	259.599	Inner ring	18	0	18.00
19	271.961	None	-	-	-
20	285.845	Inner ring	19	1.14	19.14
21	328.921	Inner ring	20	1.14	20.29
22	377.226	Inner ring	21	1.14	21.43
23	404.814	None	-	-	-
24	429.404	Outer ring	22	1.90	23.33
25	479.284	None	-	-	-

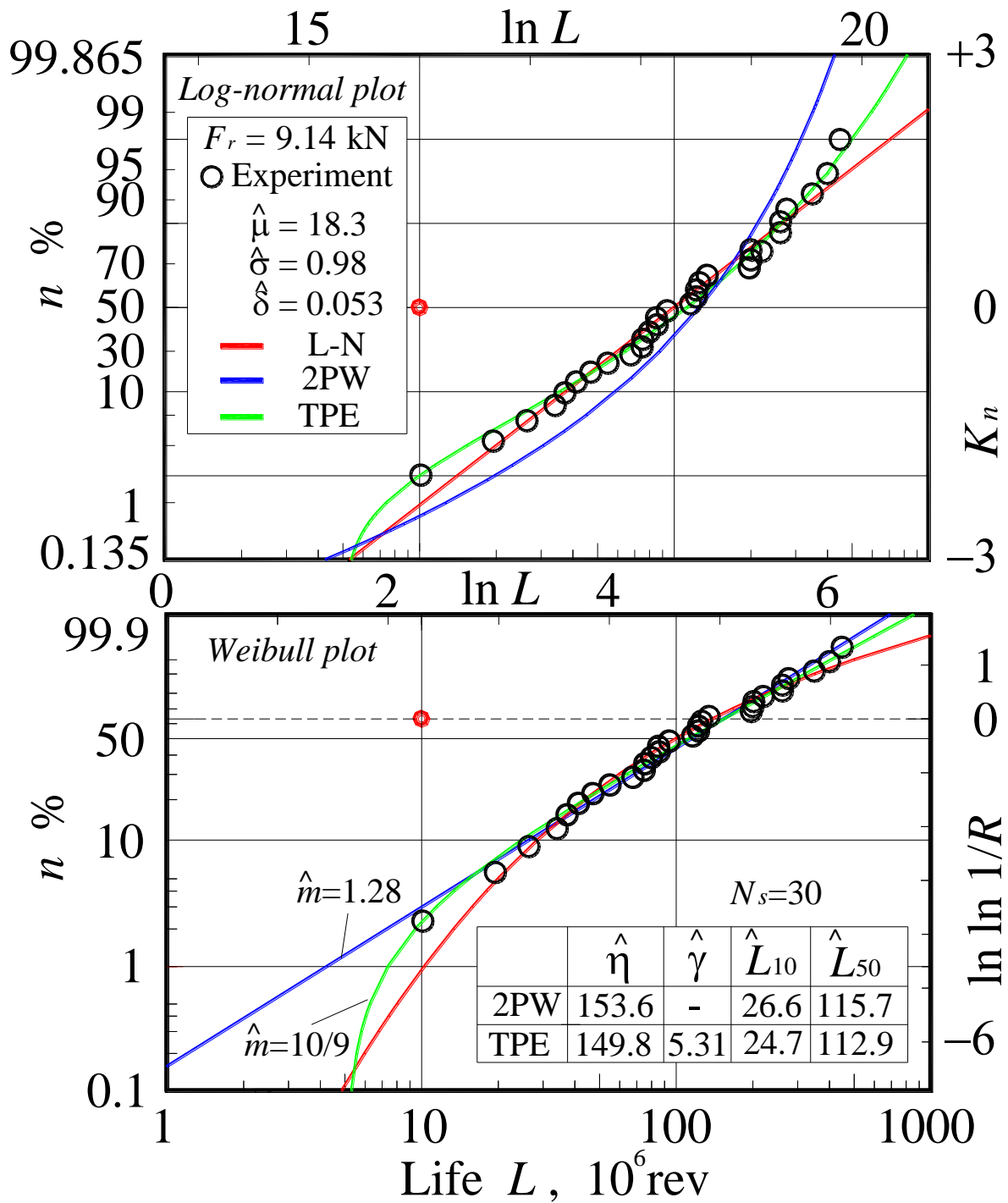


Fig.1 Weibull and log-normal plot for deep groove ball bearing

(Note)

TPE = Two Points Estimation

2PW = Two Parameter Weibull Distribution

L-N = Log -Normal Distribution

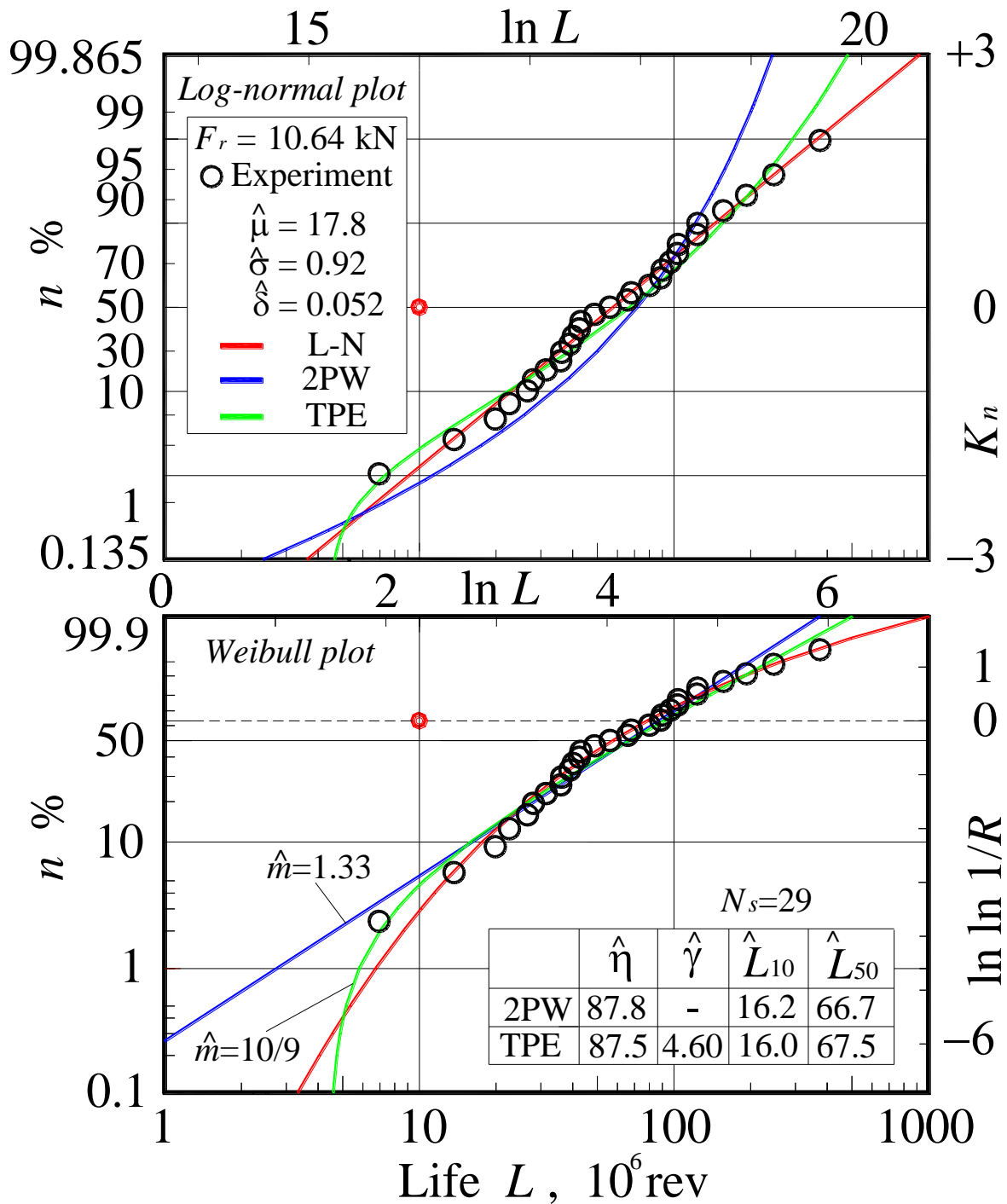


Fig.2 Weibull and log-normal plot for deep groove ball bearing

(Note)

TPE = Two Points Estimation

2PW = Two Parameter Weibull Distribution

L-N = Log -Normal Distribution

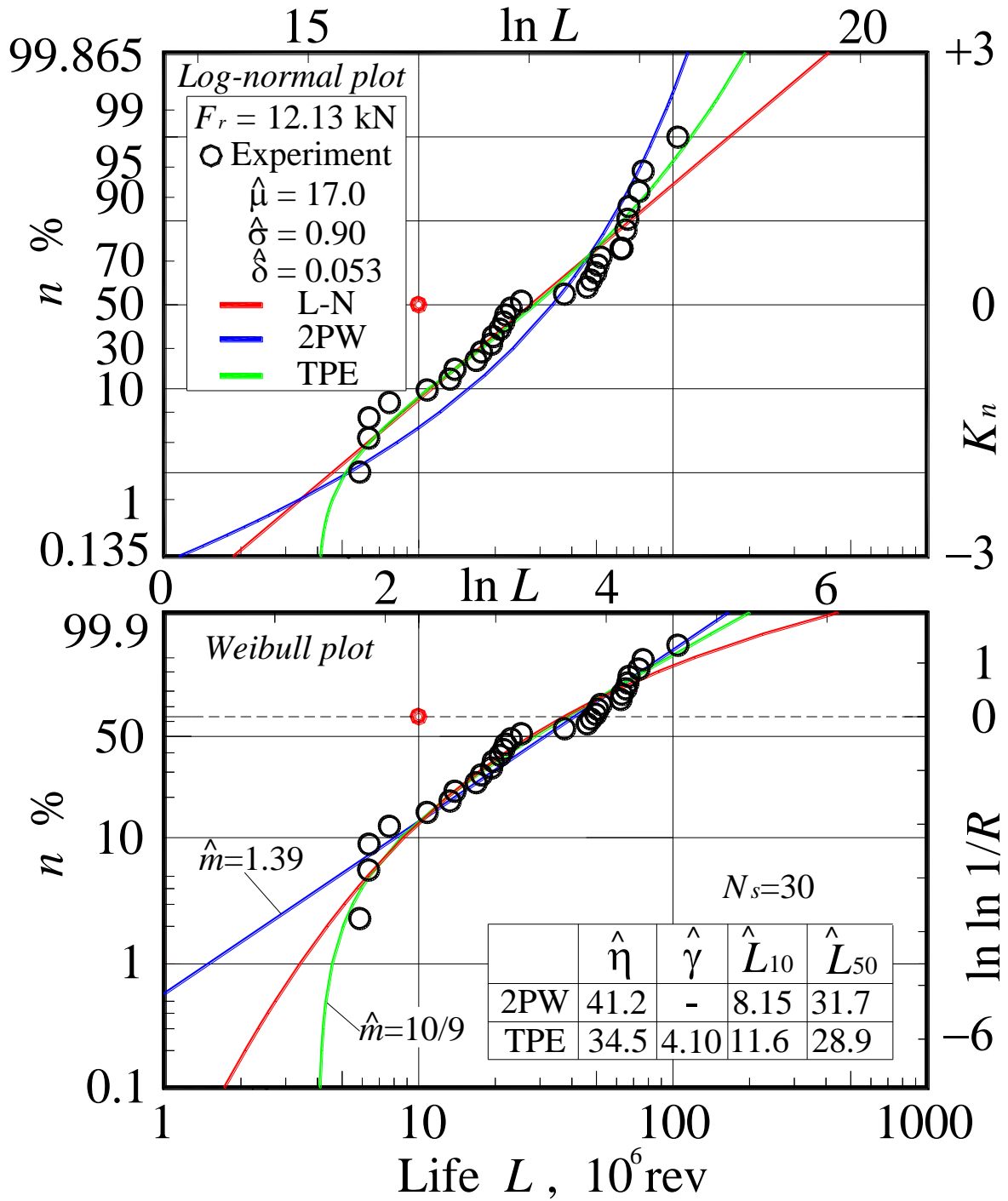


Fig.3 Weibull and log-normal plot for deep groove ball bearing

(Note)

TPE = Two Points Estimation

2PW = Two Parameter Weibull Distribution

L-N = Log -Normal Distribution

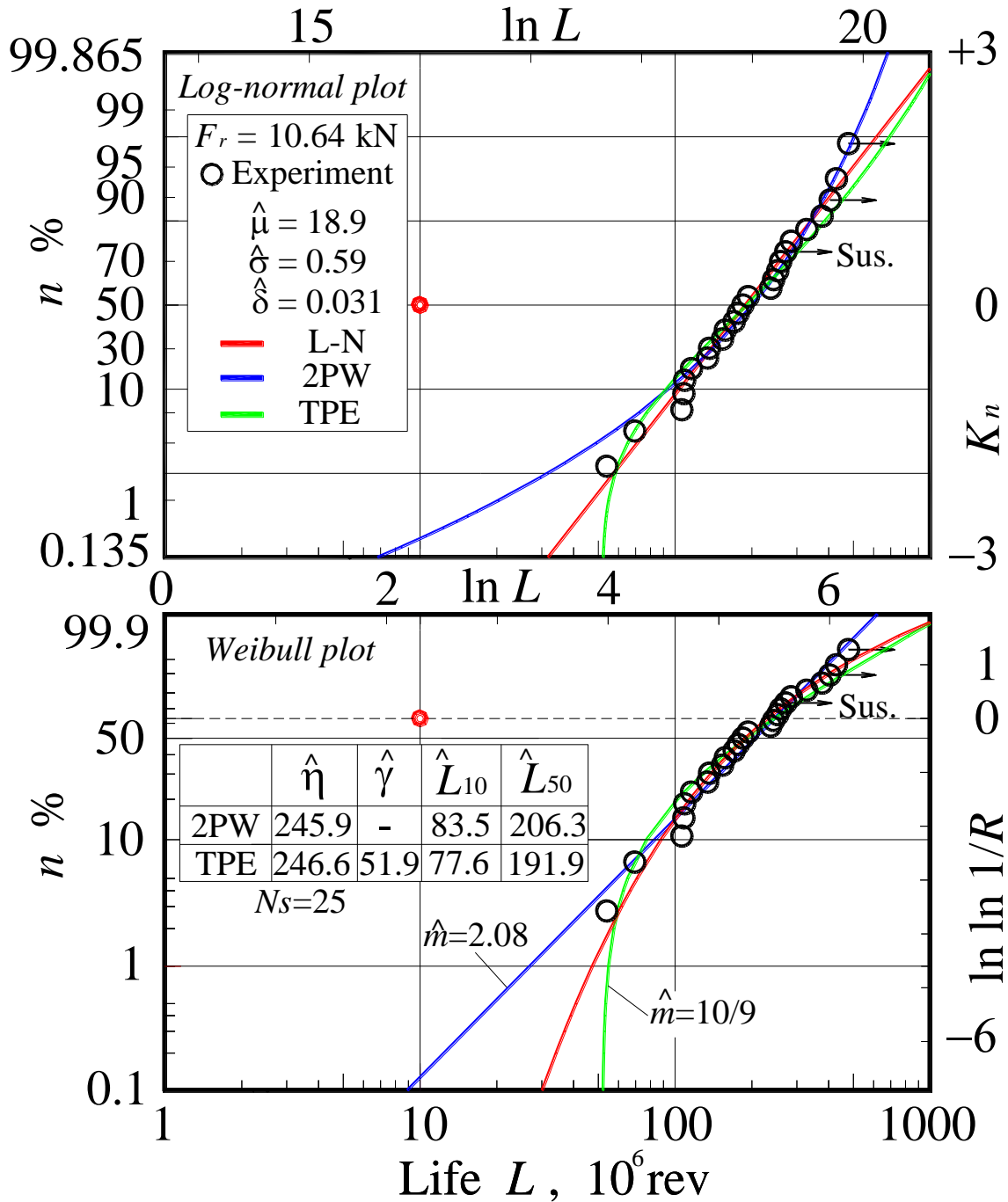


Fig.4 Weibull and log-normal plot for deep groove ball bearing that used new housing

(Note)

TPE = Two Points Estimation

2PW = Two Parameter Weibull Distribution

L-N = Log -Normal Distribution

Table 5 Weibull analysis

Regression method	$F_r = 9.14$ kN		$F_r = 10.64$ kN		$F_r = 12.14$ kN	
	2-PW	TPE	2-PW	TPE	2-PW	TPE
m	1.28	10/9	1.33	10/9	1.39	10/9
η , 10^6 rev	153.61	149.84	87.78	87.49	41.20	41.72
γ , 10^6 rev	0	5.31	0	4.60	0	2.51
L_{10} , 10^6 rev	26.59	24.76	16.04	16.18	8.15	7.61
L_{50} , 10^6 rev	115.67	112.93	66.71	67.53	31.65	30.69
C_{ex} , kN	27.28	24.37	25.01	23.40	24.43	20.90

Table 6 λb_m factor

Regression method	$F_r = 9.14$ kN		$F_r = 10.64$ kN		$F_r = 12.14$ kN	
	2-PW	TPE	2-PW	TPE	2-PW	TPE
C_{ex} , kN	27.28	24.37	25.01	23.40	24.43	20.90
C_{cat} , kN			19.5			
C_{th} , kN			22.4			
$\lambda b_m = C_{ex} / C_{cat}$	1.40	1.25	1.28	1.20	1.25	1.07
$\lambda b_m = C_{ex} / C_{th}$	1.21	1.09	1.12	1.04	1.09	0.93

Table 7 Weibull analysis for deep groove ball bearing that used new housing

Regression method	$F_r = 10.64$ kN	
	2PW	TPE
m	2.08	10/9
η , 10^6 rev	247.24	194.41
γ , 10^6 rev	0	52.17
L_{10} , 10^6 rev	83.49	77.52
L_{50} , 10^6 rev	206.27	191.85
C_{ex} , kN	46.1	31.22

Table8 λb_m factor for deep groove ball bearing that used new housing

Regression method	$F_r = 10.64$ kN	
	2PW	TPE
C_{ex} , kN	46.1	31.22
C_{cat} , kN	19.5	
C_{th} , kN	19.0	
$\lambda b_m = C_{ex} / C_{ca}$	2.36	1.61
$\lambda b_m = C_{ex} / C_{th}$	2.06	1.65

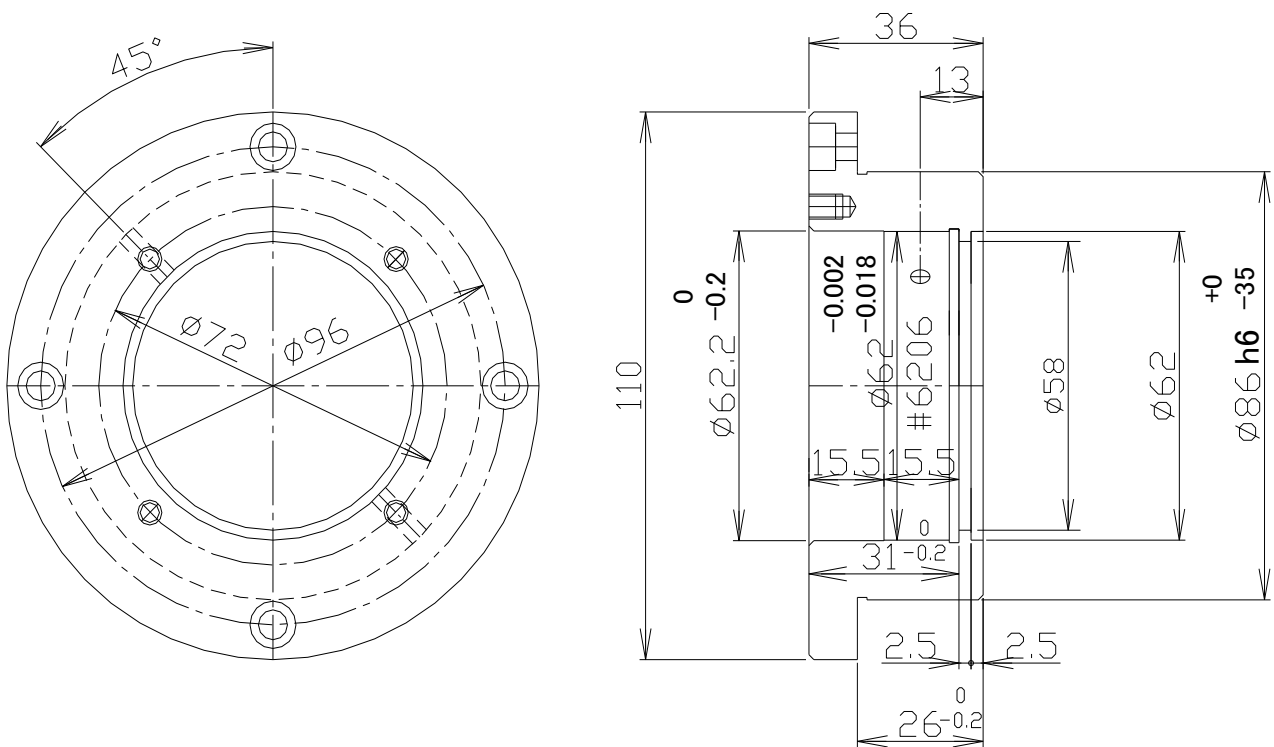


Fig.5 New Housing (Tight fit)