





PRIMARY BATTERY TESTING

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REPORT NO:

2205347STO-006

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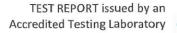
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PRIMARY BATTERY TESTING

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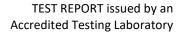
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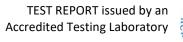
EXECUTIVE SUMMARY

Discharge testing have been performed on alkaline batteries in accordance with IEC 60086-2. Discharge time to specified voltage levels have been determined.

Types LR6/	Everactive
Applications	Industrial
Motor/toy	7,2
(hours, Avg/std)	0,2
Radio/Clock	42,9
(hours, Avg/std)	1,8
Types LR03/	Everactive
Applications	Industrial
Тоу	262,9
(minutes, Avg/std)	1,7
Digital audio	19,8
(hours, Avg/std)	0,6

The test results apply only to the tested samples.









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References:

IEC 60086-1, Ed. 13.0, 2021 IEC 60086-2, Ed. 14.0, 2021



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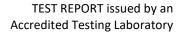
1 COMMISSION

The commission was conducted in accordance with our proposal No. SO2205347

Alkaline primary batteries have been tested in accordance with IEC 60086-2. Test conditions are according to IEC 60086-1. Discharge time to specified voltage levels has been determined.

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2 TEST SAMPLES

Table 2.1

Brand	IEC Designation	Date Code	Delivery Date	ES Number
Everactive Industrial	LR6	02-2027	2022-06-22	ES22-046
Everactive Industrial	LR03	02-2027	2022-06-22	ES22-046

note: ES number is Intertek Semko AB identification for each sample. Test samples were delivered from the client to Intertek Semko AB for testing.

Photograph of tested products:





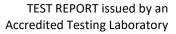
Figure 2.1 Everactive Industrial LR6

Figure 2.2 Everactive Industrial LR03

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3 TEST PROGRAM

Test methods in Table 3.1 are according to IEC 60086-2. These methods are accredited by SWEDAC.

Table 3.1: Test program including IEC 60086-2 requirements for minimum average duration (MAD)

Type LR6 applications	Load	Load interval	End voltage	MAD (IEC)
Motor/toy	3.9 Ω	1h/d	0,8 V	5 h
Radio/Clock	50 mA	1h/8h	1,0 V	30 h
Type LR03 applications	Load	Load interval	End voltage	MAD (IEC)
Toy	5,1 Ω	1h/d	0,8 V	120 min
Digital audio	50 mA	1 h/12 h, 24 h/d	0,9 V	12 h

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4 TEST CONDITIONS

Test conditions are according to IEC 60086-1.

IEC 60086-1 testing was performed on a PEC test system BDT1012 for primary batteries. The batteries were connected to the discharge circuits by pressure contacts.

OCV measurements: Tektronix DMM830, Intertek ID: 31671

Temperature and Humidity measurements: Rotronic Hygrolog, Intertek ID No. 13957

Ambient temperature during test: $21 \pm 1^{\circ}$ C Humidity: 45 - 65 % RH

The time to voltage levels / cut-off voltage was determined by scanning every 10 ms and registration with ΔV and Δt .

4.1 Uncertainty of load resistance, voltage measurement and load current

The uncertainty of load resistance is calculated to be less than ± 0.5 % based on calibrations. The uncertainty of voltage measurement is calculated to be ≤ 0.25 % based on calibrations. The uncertainty of load current is calculated to be less than ± 0.5 % based on calibrations. The uncertainty of time is calculated to be less then tolerances given in Table 4.1.

Table 4.1

Time "accuracy"	Discharge time td	Tolerance
	0 < td ≤ 2 s	± 5 % of <i>t</i> d
	2 s < td ≤ 100 s	± 0,1 s
	td > 100 s	± 0,1 % of td

Measurement uncertainty is reported in accordance with the EA publication EA-4/16 "EA guidelines on the expression of uncertainty in quantitative testing", December 2003 and is indicated by the coverage factor k = 2 which for normal distribution corresponds to a coverage probability of about 95%.

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5 TEST RESULTS

Test results are summarized in Tables 5.1 - 5.2 below.

Test start: 2022-06-28 Test end: 2022-07-20

Result: Discharge time to end voltage

Tables showing life of individual batteries, discharged to specified end voltages are compiled in Appendix A.

The test results apply only to the tested samples.

Table 5.1 Summary of test results for LR6

•	
Types LR6/	Everactive
Applications	Industrial
Motor/toy	7,2
(hours, Avg/std)	0,2
Radio/Clock	42,9
(hours, Avg/std)	1,8

Table 5.2 Summary of test results for LR03

Types LR03/	Everactive
Applications	Industrial
Тоу	262,9
(minutes, Avg/std)	1,7
Digital audio	19,8
(hours, Avg/std)	0,6

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Application:	Motor/toy												
Product:	Everact	Everactive Industrial											
Type:	LR6	LR6											
Load:	3,9 ohm	3,9 ohm, 1h/d											
Test date:	2022-06	5-28											
Cell#:	Test Id	Mfg Date:	Date code	Made In	OCV	1,3 V	1,2 V	1,1 V	1,0 V	0,9 V	0,8 V		
1	12625	NA	02-2027	NA	1,642	0,71	1,91	3,95	5,71	6,72	7,30		
2	12625	NA	02-2027	NA	1,638	0,69	1,91	4,40	5,74	6,72	7,28		
3	12625	NA	02-2027	NA	1,425	0,68	1,90	4,00	5,76	6,78	7,33		
4	12625	NA	02-2027	NA	1,639	0,68	1,90	4,41	5,73	6,69	7,00		
5	12625	NA	02-2027	NA	1,640	0,70	1,93	4,41	5,76	6,79	7,32		
6	12625	NA	02-2027	NA	1,642	0,71	1,93	4,40	5,75	6,74	7,31		
7	12625	NA	02-2027	NA	1,642	0,69	1,92	4,43	5,80	6,79	7,33		
8	12625	NA	02-2027	NA	1,642	0,69	1,89	3,99	5,72	6,69	6,97		
	Average (hours)					0,7	1,9	4,2	5,7	6,7	7,2		
				Std. Dev.		0,0	0,0	0,2	0,0	0,0	0,2		
NA = Not Avail	able			Max (hours)		0,7	1,9	4,4	5,8	6,8	7,3		
IEC 60086-2 En	id voltage	(Bold font)		Min (hours)		0,7	1,9	4,0	5,7	6,7	7,0		

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Application:	Radio/Clock/Remote Control											
Product:	Everact	Everactive Industrial										
Туре:	LR6	LR6										
Load:	50 mA,	1h/8h 24h/d										
Test date:	2022-06	5-28										
Cell#:	Test Id	Mfg Date:	Date code	Made In	OCV	1,3 V	1,2 V	1,1 V	1,0 V	0,9 V	0,8 V	
9	12626	NA	02-2027	NA	1,641	19,52	31,92	38,43	40,78	42,84	43,94	
10	12626	NA	02-2027	NA	1,6418	19,62	33,78	41,63	44,85	47,42	48,43	
11	12626	NA	02-2027	NA	1,6426	19,57	31,63	37,61	40,42	42,31	43,30	
12	12626	NA	02-2027	NA	1,6415	18,99	32,76	39,61	42,54	44,53	45,55	
13	12626	NA	02-2027	NA	1,6416	19,54	32,87	39,78	42,67	44,79	45,92	
14	12626	NA	02-2027	NA	1,6382	18,93	32,81	39,82	42,77	44,94	46,30	
15	12626	NA	02-2027	NA	1,6388	18,94	32,77	39,91	43,64	45,68	46,78	
16	12626	NA	02-2027	NA	1,6419	19,58	33,79	41,92	45,84	48,33	49,29	
			A	verage (hours)		19,3	32,8	39,8	42,9	45,1	46,2	
				Std. Dev.		0,3	0,8	1,4	1,8	2,1	2,0	
NA = Not Avail	able			Max (hours)		19,6	33,8	41,9	45,8	48,3	49,3	
IEC 60086-2 En	d voltage	(Bold font)		Min (hours)		18,9	31,6	37,6	40,4	42,3	43,3	

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Application:	Toy												
Product:	Everact	tive Industri	al										
Type:	LR03	LR03											
Load:	5,1 ohm	5,1 ohm, 1h/day											
Test date:	2022-06	5-28											
Cell#:	Test Id	Mfg Date:	Date code	Made In	OCV	1,3 V	1,2 V	1,1 V	1,0 V	0,9 V	0,8 V		
1	12629	NA	02-2027	NA	1,640	21,57	47,29	113,82	200,33	224,96	262,13		
2	12629	NA	02-2027	NA	1,640	21,93	48,56	114,78	200,98	226,73	263,77		
3	12629	NA	02-2027	NA	1,639	22,29	49,48	115,43	201,12	226,81	262,63		
4	12629	NA	02-2027	NA	1,641	23,75	51,80	117,90	202,88	229,63	265,28		
5	12629	NA	02-2027	NA	1,641	21,89	48,52	116,93	202,80	229,80	265,21		
6	12629	NA	02-2027	NA	1,640	22,29	49,04	113,18	199,30	223,30	260,63		
7	12629	NA	02-2027	NA	1,640	22,25	49,44	113,27	179,80	222,53	261,15		
8	12629	NA	02-2027	NA	1,640	21,95	48,35	112,64	200,33	224,83	262,47		
	Average (minutes)					22,2	49,1	114,7	198,4	226,1	262,9		
				Std. Dev.		0,7	1,3	1,9	7,6	2,7	1,7		
NA = Not Avail	able			Max (minutes))	23,8	51,8	117,9	202,9	229,8	265,3		
IEC 60086-2 En	d voltage	(Bold font)		Min (minutes))	21,6	47,3	112,6	179,8	222,5	260,6		

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Application:	Digital	audio										
Product:	Everact	tive Industri	al									
Type:	LR03	LR03										
Load:	50 mA,	50 mA, 1h/12h 24h/d										
Test date:	2022-06	5-28										
Cell#:	Test Id	Mfg Date:	Date code	Made In	OCV	1,3 V	1,2 V	1,1 V	1,0 V	0,9 V	0,8 V	
9	12630	NA	02-2027	NA	1,640	6,67	12,72	15,92	17,60	18,41	18,66	
10	12630	NA	02-2027	NA	1,640	6,62	12,83	16,88	18,80	19,78	20,34	
11	12630	NA	02-2027	NA	1,639	6,64	12,85	16,90	18,86	19,93	20,47	
12	12630	NA	02-2027	NA	1,640	6,69	12,96	17,48	19,31	20,38	20,71	
13	12630	NA	02-2027	NA	1,640	6,67	12,90	16,99	18,95	19,98	20,56	
19	12630	NA	02-2027	NA	1,641	6,68	13,42	17,56	19,43	20,51	20,86	
15	12630	NA	02-2027	NA	1,639	5,97	12,80	16,84	18,76	19,76	20,28	
16	12630	NA	02-2027	NA	1,641	5,90	12,85	16,88	18,78	19,78	20,33	
	Average (hours)					6,5	12,9	16,9	18,8	19,8	20,3	
				Std. Dev.		0,3	0,2	0,5	0,6	0,6	0,7	
NA = Not Avail	able			Max (hours)		6,7	13,4	17,6	19,4	20,5	20,9	
IEC 60086-2 En	d voltage	(Bold font)		Min (hours)		5,9	12,7	15,9	17,6	18,4	18,7	

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