YUASA

SWL SERIES

Manual 767 w/10min to 3300 W/10 min

Valve regulated lead acid Batteries

YUASA BATTERIES FRANCE

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SWL
Battery range

Yuasa proposes a full range of stationary VRLA batteries with gas recombination, regulated with valves.

With a power of 767W to 3300W per monobloc (discharge 10 min), Yuasa succeeded with this range to optimise strongly the voluminal power.

More energy

30 to 40% more energy for autonomy of 10 minutes in relation to a standard battery of the same weight, same dimensions and same service life (Fig. 1).

Thanks to a unique optimisation process on the active materials of the plates, which favours electrochemical exchange, the fast discharge performances have been increased whilst retaining an optimal service life.

SWL/NPL Comparison

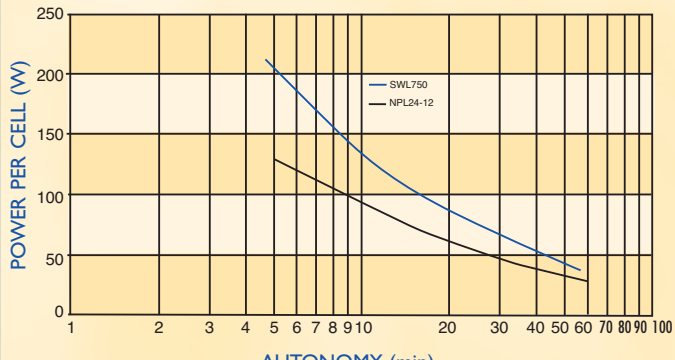


Fig 1

General characteristics

VRLA
Electrolyte immobilisation system (AGM)
Operates in any positions (except upside down)
Gas recombination at more than 99%
Low pressure safety relief valves
No maintenance
Container in ABS UL94 HB (standard) or V0 (flame retardant)
Series and parallel assembly
Lead-tin-calcium plates with high output
Long service life
Low auto-discharge / Long storage life
Wide operating temperature range
Use in floating operation.
Excellent performance with fast discharge
Good recovery after deep discharge





Specifications

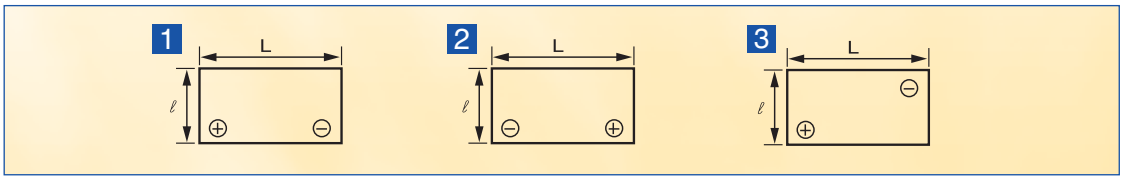
	Type of Battery	Nominal Voltage (V)	Typical Power 10min* (W)	Capacity 10h** (Ah)	Capacity 20h** (Ah)	Length (mm)	Width (mm)	Height (mm)	Weight (Kg)	Layout (bilow)	Terminals (bilow)	maximum Current in 1 mn (A)	maximum Current in 1 sec. (A)	Internal Impedance (mΩ)***
FR	SWL750	12	767	22.9	24.4	166	175	125	9.3	2	A	150	500	8.5
FR	SWL1100	12	1202	39.6	40	197	165	170	14.5	2	B	200	500	6.0
• FR	SWL1800	12	1974	55	56.6	216	168	223	23	1	B	400	800	6.0
FR	SWL1850	12	1916	66	72	350	166	174	23.8	2	C	500	800	4.4
• FR	SWL2250	12	2250	76	84	380	166	185	28.4	2	C	500	800	2.5
• FR	SWL2300	12	2464	78	79	259	168	212.5	27	1	B	500	800	5.5
• FR	SWL2300E	12	2464	78	79	261	168	223	27	1	B	500	800	5.5
• FR	SWL2500	12	2940	90	92.4	305	173	223	32.6	1	C	500	800	6.0
• FR	SWL2500E	12	2940	90	92.4	305	168	223	32	1	B	500	800	3.5
• FR	SWL3300	12	3300	102.5	108.4	350	168	225	38	1	C	550	1100	3
• FR	SWL1850-6	6	1344	132	144	350	166	174	23.5	3	C	500	800	1.6

- * : Final voltage at 1.6V/cell – Temperature 20°C.
- ** : C_{10} or C_{20} / Final voltage at 1.8V/cell – Temperature 20°C
- *** : Battery charged and measured at 1000 Hz.

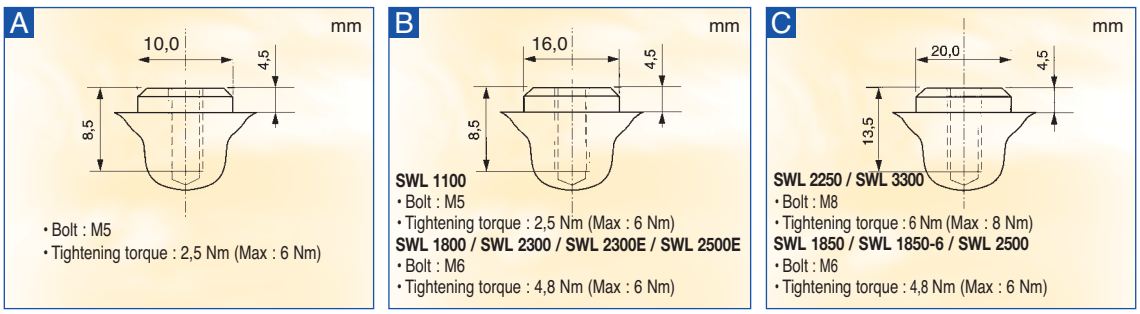
• **FR** : UL94-V0 container as standard.
FR : Optional UL94-V0 container.

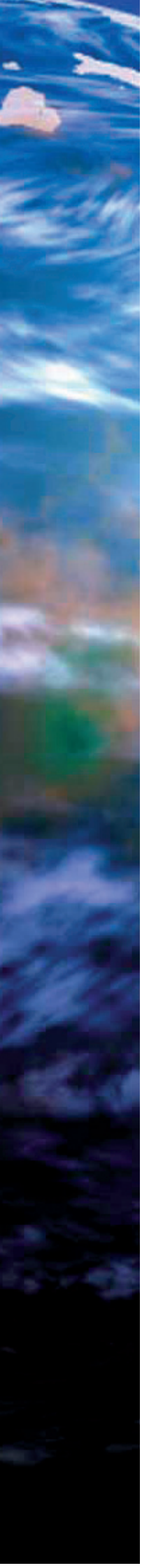
The capacity at C100 (100h) = Capacity at C20 (20h) x 1,1.
Ex : the capacity at 100h for SWL 2500 is 101 Ah .

Layout



Terminals





Performance tables for constant power discharge

Discharge power (Watt) per cell for final voltage of 1.6V at 20°C

Type of Battery	AUTONOMY						Minutes				Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	239	196	179	128	105	87.5	66.3	51.5	42.4	38.0	28.3	23.1	18.6	15.7	11.8	9.68	8.08	5.83	4.01	3.06
SWL1100	346	285	263	200	160	129	94.0	77.8	67.0	58.7	42.7	33.7	28.0	24.2	18.8	15.8	13.7	9.67	6.64	5.08
SWL1800	553	476	440	329	257	213	160	128	108	92.8	65.3	51.8	44.0	38.5	30.9	25.3	21.3	13.1	9.12	7.05
SWL1850	536	453	420	319	254	210	153	125	109	96.3	70.0	54.2	45.2	39,7	31.7	27.0	23.3	16.3	11.2	8.56
SWL2250	582	524	492	375	307	251	182	149	128	112	82.7	65.9	54.9	48.2	38.5	32.8	28.4	19.9	13.6	10.4
SWL2300/E	661	571	513	411	313	253	194	158	133	117	83.9	65.3	54.3	46.2	36.4	30.4	26.1	16.2	11.1	8.6
SWL2500/E	751	649	583	490	373	303	236	188	158	135	95.3	74.2	61.7	53.7	42.3	35.3	30.3	19.3	13.2	10.0
SWL3300	769	767	697	550	433	359	273	220	185	161	115	89.6	74.5	64.6	51.0	42.3	35.9	22.0	15.2	11.8
SWL1850-6	494	481	474	448	416	384	273	229	201	177	135	107	89.5	78.6	62.8	53.5	46.1	32.3	22.2	17.0

Discharge power (Watt) per cell for final voltage of 1.65V at 20°C

Type of Battery	AUTONOMY						Minutes				Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	229	191	176	127	105	87.3	66.2	51.2	42.2	37.8	28.2	23.0	18.5	15.6	11.7	9.53	7.92	5.67	3.89	2.98
SWL1100	331	276	256	196	158	128	93.5	77.3	66.7	58.2	42.2	33.3	27.7	24.0	18.5	15.5	13.5	9.33	6.41	4.90
SWL1800	530	458	424	322	256	211	158	127	107	92.3	64.8	51.5	43.8	38.3	30.7	25.2	21.2	13.0	9.05	6.98
SWL1850	511	437	411	318	252	209	153	125	109	95.5	69.7	53.7	44.7	39.3	31.3	26.7	23.0	16.0	11.0	8.40
SWL2250	578	517	483	370	305	249	180	148	127	111	82.3	65.3	54.3	47.8	38.1	32.4	28.0	19.5	13.4	10.2
SWL2300/E	645	532	494	400	309	250	192	157	133	117	81.7	64.6	54.1	45.9	36.3	30.3	26.0	16.2	11.1	8.6
SWL2500/E	733	605	562	477	370	302	233	186	155	132	92.9	73.4	61.5	53.4	42.2	35.2	30.2	19.3	13.2	10.0
SWL3300	715	714	657	533	423	353	271	219	184	160	114	89.2	74.3	64.3	50.8	42.2	35.8	22.0	15.2	11.8
SWL1850-6	494	481	474	448	416	384	272	228	200	175	134	106	88.5	77.8	62.0	52.9	45.5	31.7	21.8	16.6

Discharge power (Watt) per cell for final voltage of 1.7V at 20°C

Type of Battery	AUTONOMY						Minutes				Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	217	183	168	124	103	86.7	65.8	50.8	42.1	37.6	28.0	22.9	18.4	15.5	11.5	9.44	7.83	5.58	3.83	2.93
SWL1100	314	264	245	190	154	127	93.2	77.0	66.3	57.5	41.8	32.8	27.3	23.8	18.3	15.3	13.3	9.00	6.18	4.73
SWL1800	504	431	401	312	253	210	157	126	106	91.8	64.5	51.3	43.7	38.2	30.6	25.0	21.0	12.9	9.00	6.93
SWL1850	489	437	405	313	247	209	153	124	108	94.7	69.3	53.3	44.3	39.0	31.0	26.3	22.7	15.7	10.8	8.24
SWL2250	565	497	463	359	300	248	177	146	126	110	81.9	64.9	53.9	47.4	37.7	32.0	27.6	19.1	13.1	10.0
SWL2300/E	598	500	480	380	302	246	190	155	132	116	81.5	64.5	53.9	45.8	36.3	30.1	26.0	16.2	11.1	8.6
SWL2500/E	680	568	545	453	363	299	223	180	150	131	92.7	73.3	61.3	53.2	42.2	35.0	30.2	19.3	13.2	10.0
SWL3300	667	666	622	509	412	346	267	216	182	158	113	88.6	73.8	64.1	50.5	42.0	35.6	21.8	15.1	11.7
SWL1850-6	492	479	472	447	415	383	272	227	199	174	133	106	87.7	77.2	61.4	52.1	44.9	31.1	21.3	16.3

Discharge power (Watt) per cell for final voltage of 1.75V at 20°C

Type of Battery	AUTONOMY						Minutes				Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	203	173	159	120	100	85.0	64.7	49.7	41.9	37.1	27.7	22.8	18.3	15.2	11.3	9.35	7.75	5.50	3.78	2.89
SWL1100	294	249	232	181	148	124	91.7	76.0	65.3	56.8	41.5	32.5	27.2	23.7	18.2	15.2	13.2	8.83	6.07	4.64
SWL1800	453	389	365	298	245	205	155	125	106	90.5	63.5	50.8	43.3	38.0	30.4	24.8	20.8	12.9	8.95	6.88
SWL1850	450	392	367	287	240	205	150	124	108	94.0	69.0	53.0	44.0	38.7	30.7	26.0	22.3	15.3	10.5	8.03
SWL2250	541	464	433	341	289	242	176	145	125	109	81.5	64.5	53.5	47.0	37.3	31.6	27.2	18.6	12.8	9.79
SWL2300/E	532	477	459	360	288	238	187	152	129	114	81.0	63.8	53.7	45.5	35.9	29.9	25.8	16.1	10.9	8.5
SWL2500/E	605	542	522	430	347	294	221	179	148	131	92.0	72.5	61.0	52.9	41.7	34.8	30.0	19.2	13.0	9.89
SWL3300	609	607	579	477	395	333	262	213	179	157	112	87.6	73.1	63.5	50.2	41.7	35.3	21.7	15.0	11.7
SWL1850-6	482	469	463	438	407	375	266	226	198	172	133	105	87.1	76.6	60.8	51.5	44.2	30.3	20.8	15.9

Discharge power (Watt) per cell for final voltage of 1.8V at 20°C

Type of Battery	AUTONOMY																			
	Minutes										Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	190	162	148	114	96.8	82.2	62.5	48.0	40.9	36.9	27.0	22.8	17.9	14.9	11.2	9.26	7.67	5.42	3.72	2.84
SWL1100	276	240	224	172	141	119	88.3	74.0	63.8	55.5	40.5	31.7	26.5	23.2	18.0	15.0	13.0	8.67	5.95	4.55
SWL1800	406	354	335	280	232	196	150	122	102	87.8	61.7	49.7	42.5	37.3	30.0	24.5	20.5	12.8	8.87	6.83
SWL1850	342	305	291	252	232	196	149	122	106	93.3	67.7	52.7	43.7	38.3	30.5	25.8	22.2	15.2	10.4	7.98
SWL2250	506	440	404	318	272	230	174	144	124	108	79.9	64.1	53.1	46.6	37.1	31.4	27.0	18.4	12.7	9.68
SWL2300/E	466	446	436	335	269	225	178	146	126	111	80.4	63.1	53.2	45.3	35.5	29.7	25.6	16.0	10.8	8.3
SWL2500/E	530	507	495	400	320	285	216	175	146	125	91.3	71.7	60.5	52.6	41.3	34.5	29.8	19.0	12.8	9.69
SWL3300	555	554	522	443	368	314	250	206	175	152	109	85.6	71.7	62.4	49.3	41.0	34.7	21.3	14.8	11.5
SWL1850-6	461	449	443	419	389	359	265	223	195	171	130	104	86.5	75.8	60.4	51.1	44.0	30.1	20.6	15.8

Discharge power (Watt) per cell for final voltage of 1.85V at 20°C

Type of Battery	AUTONOMY																			
	Minutes										Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	154	136	130	106	90.0	77.0	59.2	44.7	38.3	35.5	26.2	21.8	17.1	14.6	11.0	9.17	7.58	5.33	3.66	2.80
SWL1100	228	196	185	151	132	110	83.8	70.5	60.8	51.7	38.2	30.2	25.5	22.3	17.8	14.8	12.8	8.50	5.84	4.46
SWL1800	327	309	301	271	231	191	141	116	98.3	85.2	60.3	48.5	41.3	36.0	29.0	23.7	20.0	12.4	8.67	6.68
SWL1850	279	262	256	236	218	180	141	117	102	89.7	65.7	51.7	43.3	37.7	30.3	25.7	22.0	15.0	10.3	7.88
SWL2250	453	372	350	293	253	213	165	137	117	104	77.5	62.8	52.7	45.8	36.9	31.2	26.8	18.2	12.5	9.58
SWL2300/E	441	397	380	309	245	208	167	137	120	104	76.8	60.1	50.1	40.9	33.7	28.6	24.8	15.5	10.5	8.1
SWL2500/E	502	452	432	368	290	276	205	164	138	120	87.3	68.3	56.9	47.6	39.2	33.2	28.8	18.5	12.5	9.49
SWL3300	471	470	446	400	335	291	234	194	165	144	103	81.7	68.8	60.3	47.5	39.3	33.5	20.9	14.4	11.2
SWL1850-6	423	412	406	384	357	329	252	214	186	164	126	102	85.7	74.6	60.0	50.9	43.6	29.7	20.4	15.6

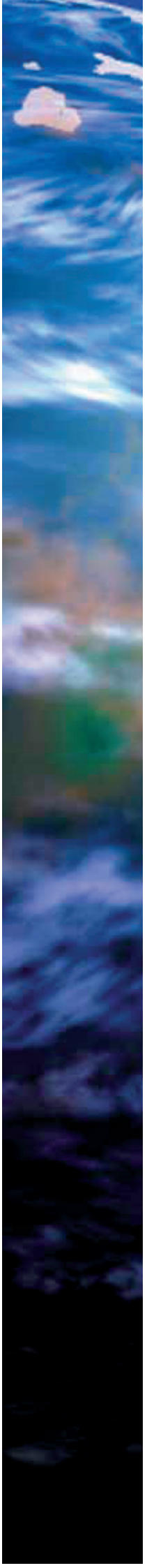
Performance tables for constant current discharge

Discharge current (Ampere) for final voltage of 1.6V per cell at 20°C

Type of Battery	AUTONOMY																			
	Minutes										Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	130	101	90.6	67.8	52.9	43.5	31.7	24.8	20.6	17.9	13.3	10.8	8.94	7.70	5.68	4.30	3.47	2.50	1.66	1.35
SWL1100	180	142	129	95.7	76.0	64.6	49.7	40.0	32.6	27.5	19.6	15.2	12.2	10.2	8.14	7.46	6.84	4.22	2.80	2.15
SWL1800	320	243	217	156	117	94.9	70.1	56.4	47.9	41.7	30.7	24.2	20.1	17.3	13.6	11.1	9.39	5.75	3.86	2.91
SWL1850	301	231	207	145	115	96.3	73.1	58.7	50.5	45.3	34.5	28.6	23.9	20.3	15.2	12.7	11.1	7.00	5.00	4.00
SWL2250	392	320	293	217	161	131	100	81.5	68.7	59.6	44.2	36.4	30.8	26.7	20.8	16.1	13.4	8.60	6.40	4.80
SWL2300/E	353	310	299	235	200	140	90.0	72.8	58.5	48.0	30.6	25.2	20.4	16.8	15.8	15.0	13.5	9.28	6.72	4.70
SWL2500/E	465	356	330	262	201	159	117	96.2	81.7	71.6	49.8	37.9	30.9	26.4	20.5	17.2	14.6	9.48	6.38	4.79
SWL3300	437	436	395	305	240	196	142	112	93.4	80.8	57.7	45.3	38.0	32.7	24.8	20.4	17.1	10.8	7.39	5.64
SWL1850-6	248	241	238	225	209	193	146	117	101	90.6	69.0	57.2	47.8	40.6	30.3	25.4	22.2	14.0	10.0	8.00

Discharge current (Ampere) for final voltage of 1.65V per cell at 20°C

Type of Battery	AUTONOMY																			
	Minutes										Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	125	98.2	88.9	67.4	52.5	43.1	31.3	24.6	20.3	17.6	13.1	10.7	8.79	7.60	5.56	4.20	3.39	2.44	1.61	1.31
SWL1100	171	137	126	94.6	75.5	64.2	49.3	39.7	32.3	27.2	19.4	15.1	12.0	10.1	8.08	7.37	6.74	4.15	2.74	2.10
SWL1800	299	230	205	147	113	93.5	69.6	56.1	47.4	41.0	29.9	23.8	19.8	17.0	13.4	11.0	9.38	5.74	3.85	2.91
SWL1850	281	225	204	144	114	96.0	72.9	58.4	50.2	45.1	34.3	28.5	23.7	20.1	15.0	12.6	10.9	6.90	4.90	3.90
SWL2250	360	303	281	213	159	130	99.5	80.9	68.1	59.3	43.8	35.9	30.3	26.2	20.1	15.6	13.0	8.30	6.10	4.60
SWL2300/E	336	306	290	232	197	138	88.0	72.8	57.8	48.0	30.0	24.6	20.4	16.8	15.7	14.9	13.4	9.20	6.72	4.62
SWL2500/E	402	335	314	250	193	155	115	95.1	81.3	71.0	49.3	37.8	31.0	26.3	20.5	17.1	14.6	9.39	6.35	4.77
SWL3300	400	399	364	296	233	192	140	110	92.6	79.7	57.2	45.1	38.0	32.6	24.7	20.3	17.1	10.7	7.36	5.61
SWL1850-6	247	240	237	224	208	192	146	117	100	90.2	68.6	57.0	47.4	40.2	29.9	25.1	21.8	13.8	9.80	7.80



Discharge current (Ampere) for final voltage of 1.7V per cell at 20°C

Type of Battery	AUTONOMY			Minutes							Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	117	94.0	86.1	66.9	52.2	42.9	31.1	24.4	20.2	17.5	13.0	10.6	8.69	7.52	5.46	4.10	3.31	2.39	1.57	1.28
SWL1100	159	131	121	92.9	74.4	63.7	49.0	39.4	32.2	27.1	19.2	15.0	11.8	10.0	8.00	7.28	6.64	4.08	2.68	2.06
SWL1800	266	212	194	141	109	90.1	68.3	55.4	47.2	40.6	29.6	23.4	19.6	16.9	13.3	11.0	9.33	5.71	3.84	2.90
SWL1850	259	217	200	142	113	95.6	72.5	58.2	49.9	44.8	34.2	28.3	23.5	20.0	14.8	12.4	10.7	6.80	4.80	3.80
SWL2250	326	284	267	205	155	128	98.9	80.4	67.6	59.0	43.5	35.4	29.8	25.7	19.6	15.1	12.6	8.00	5.90	4.40
SWL2300/E	338	300	274	227	193	133	84.0	67.2	53.9	47.0	30.0	24.0	19.8	16.3	15.4	14.6	13.4	9.20	6.72	4.62
SWL2500/E	350	311	297	241	185	152	114	93.5	80.0	69.8	48.4	37.3	30.8	26.2	20.3	16.8	14.4	9.33	6.28	4.72
SWL3300	356	355	332	286	223	186	138	109	91.5	78.5	56.6	44.7	37.5	32.1	24.5	19.9	16.8	10.6	7.28	5.55
SWL1850-6	245	238	235	223	207	191	145	116	99.8	89.6	68.4	56.6	47.0	40.0	29.5	24.8	21.4	13.6	9.60	7.60

Discharge current (Ampere) for final voltage of 1.75V per cell at 20°C

Type of Battery	AUTONOMY			Minutes							Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	106	88.4	82.0	65.3	51.8	42.7	30.9	24.2	20.1	17.4	12.9	10.5	8.59	7.45	5.40	4.00	3.24	2.34	1.53	1.25
SWL1100	146	124	116	90.0	72.7	62.3	48.3	38.8	31.8	26.9	19.0	14.7	11.7	9.87	7.90	7.19	6.54	4.02	2.62	2.03
SWL1800	242	200	179	135	106	88.2	67.3	54.8	46.8	40.5	29.5	23.3	19.5	16.8	13.2	10.8	9.21	5.62	3.80	2.88
SWL1850	232	208	197	139	112	94.9	72.1	58.0	49.7	44.5	34.1	28.1	23.3	19.9	14.6	12.3	10.6	6.70	4.70	3.70
SWL2250	298	259	240	186	147	124	97.3	79.0	66.5	57.9	43.2	34.9	29.4	25.2	19.1	14.7	12.2	7.80	5.70	4.30
SWL2300/E	318	290	255	220	186	126	78.0	66.5	53.2	46.0	30.0	23.0	19.8	15.5	14.8	14.2	13.3	8.00	6.23	4.05
SWL2500/E	325	298	284	232	180	149	113	93.1	78.7	68.7	48.2	37.2	30.7	26.1	20.2	16.7	14.3	9.25	6.24	4.68
SWL3300	315	314	302	265	212	176	133	106	89.6	77.0	55.6	43.9	36.8	31.4	24.0	19.6	16.6	10.5	7.20	5.51
SWL1850-6	244	237	234	222	206	190	144	116	99.3	89.0	68.2	56.2	46.6	39.8	29.2	24.6	21.2	13.4	9.40	7.40

Discharge current (Ampere) for final voltage of 1.8V per cell at 20°C

Type of Battery	AUTONOMY			Minutes							Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	94.1	81.3	76.9	62.7	50.1	41.3	30.0	23.7	19.8	17.3	12.8	10.4	8.50	7.37	5.35	3.92	3.17	2.29	1.49	1.22
SWL1100	130	117	111	85.6	69.9	60.0	46.5	37.4	30.9	26.3	18.8	14.5	11.6	9.63	7.80	7.10	6.44	3.96	2.57	2.00
SWL1800	223	189	169	130	102	84.3	64.0	51.6	44.4	39.1	29.1	23.2	19.3	16.6	12.9	10.6	8.97	5.50	3.72	2.83
SWL1850	217	198	186	133	109	92.5	70.8	57.5	49.4	44.2	34.0	27.7	23.1	19.8	14.5	12.2	10.5	6.60	4.60	3.60
SWL2250	269	227	212	170	139	118	92.6	75.7	64.6	56.3	42.1	34.1	28.5	24.4	18.6	14.4	11.9	7.60	5.50	4.20
SWL2300/E	284	280	234	212	179	119	72.0	64.4	52.5	45.0	29.4	22.0	19.2	15.0	14.4	13.8	13.2	7.80	6.15	3.95
SWL2500/E	298	270	256	216	172	146	111	89.5	76.6	66.8	47.6	36.9	30.2	25.8	19.9	16.5	14.0	9.14	6.18	4.62
SWL3300	296	294	287	238	197	163	125	101	85.6	74.1	53.9	42.5	35.7	30.2	23.2	19.0	16.2	10.2	7.05	5.42
SWL1850-6	238	232	229	216	201	185	142	115	98.8	88.4	68.0	55.4	46.2	39.6	28.9	24.4	21.0	13.2	9.20	7.20

Discharge current (Ampere) for final voltage of 1.85V per cell at 20°C

Type of Battery	AUTONOMY			Minutes							Hours									
	3	5	6	10	15	20	30	40	50	60	1.5	2	2.5	3	4	5	6	10	15	20
SWL750	83.6	74.2	70.6	58.1	46.6	38.4	27.9	22.4	18.9	16.6	12.5	10.2	8.43	7.14	5.12	3.88	3.10	2.24	1.44	1.19
SWL1100	120	107	100	79.0	65.7	56.6	43.7	35.1	28.9	25.1	18.0	14.1	11.3	9.39	7.72	7.01	6.34	3.90	2.52	1.97
SWL1800	195	166	153	117	92.6	77.6	60.1	49.1	42.4	37.4	27.8	22.2	18.4	15.8	12.3	10.1	8.57	5.26	3.57	2.71
SWL1850	200	165	147	122	100	85.6	67.5	55.9	48.6	43.4	33.3	27.3	22.5	19.2	14.3	12.1	10.4	6.50	4.50	3.50
SWL2250	183	174	170	157	137	112	85.4	70.0	60.1	52.9	40.0	33.0	27.4	23.6	17.7	13.9	11.4	7.40	5.40	4.10
SWL2300/E	257	241	233	184	149	101	76.3	60.2	49.0	42.0	28.8	23.4	19.2	15.6	13.2	13.1	13.0	7.77	5.53	3.43
SWL2500/E	256	237	227	185	153	130	101	83.6	71.9	62.5	45.2	35.7	29.7	25.4	19.6	16.3	13.9	8.93	5.97	4.53
SWL3300	282	281	258	212	175	148	114	93.6	79.2	69.3	50.7	40.3	33.7	28.5	22.0	18.1	15.4	9.79	6.75	5.24
SWL1850-6	219	214	211	199	185	171	135	112	97.2	86.8	66.6	54.6	45.0	38.4	28.6	24.2	20.8	13.0	9.00	7.00

Charging

The performances and service life of batteries depend directly on the efficiency of the charge.

Floating charge

To recharge and correctly maintain the charge of these batteries, we recommend constant voltage charge at 2.275V +/-1% per cell (at 20°C). At this voltage, no charge current limitations are necessary. The batteries will limit the current point (<2 x C_{20}*max) at the start of charging.

The ripple current must be limited to 0.1 C_{20}*. For batteries <20 Ah and 0,05 C_{20}* for batteries >20Ah.

It should be noted that for batteries connected in series, dispersion of floating voltages for each monobloc, caused by gas recombination, may be observed.

This dispersion may be of +6% / -3% at the start of the battery's life and +/- 2% after 6 months of use.

Fast charge

To recharge batteries more quickly, charge them at constant voltage of 2.35 V to 2.50V +/-1% per cell.

Particular precautions for avoiding overload :
- at this voltage level, the charge current should be limited to 0.25C_{20}*.
- the fast charge should be stopped when the charge current has reduced to less than 0.07C_{20}* and must not continue for more than 20h before switching to float charge mode.

Charging time

For a charge limited to 0.1C_{20}* or 0.25C_{20}*, the floating recharge time for completely discharged batteries (100% of the depth of the discharge) is approximately 72 hours.

In fast charge, the recharge time for completely discharged batteries cannot be less than 4 hours.

For different charge methods, figures 2, 3, 4 and 5 show the voltage rate, current and volume of the charge of the batteries in relation to time.

It should be noted that the charge volume :
- must reach 110 to 115% of the charge to obtain 100% of the capacity available.
- will be greater, for a given time, at high temperatures and lesser at lower temperatures.

** : C_{20} represents the capacity of the battery in 20h (final voltage = 1.75V/cell)*

Floating charge at constant voltage
2.275V/cell/limitation of current: 0.1C_{20}

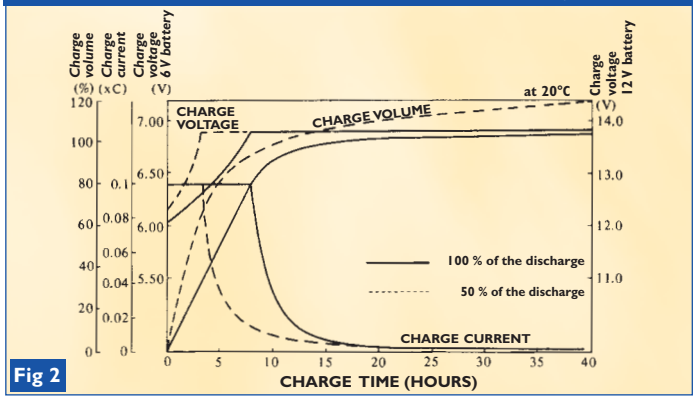


Fig 2

Floating charge at constant voltage
2.275V/cell/limitation of current: 0.25C_{20}

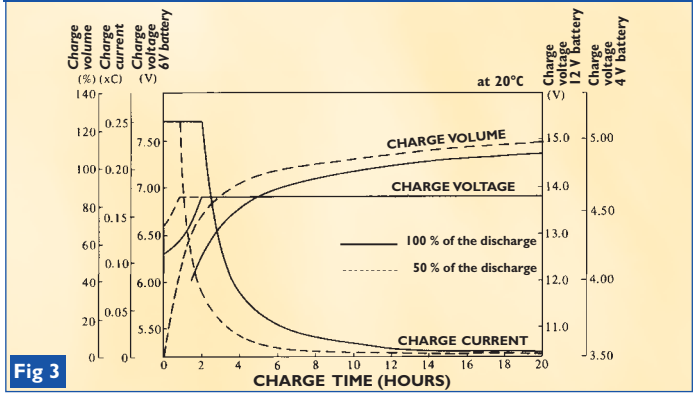


Fig 3

Fast charge at constant voltage
2.4V/cell/limitation of current: 0.1C_{20}

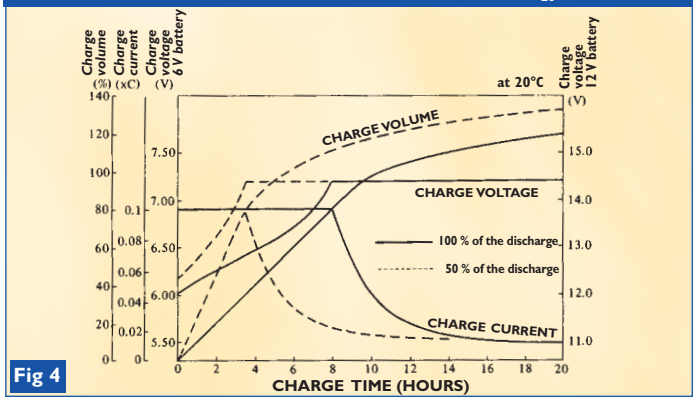


Fig 4

Fast charge at constant voltage
2.5V/cell/limitation of current: 0.25C_{20}

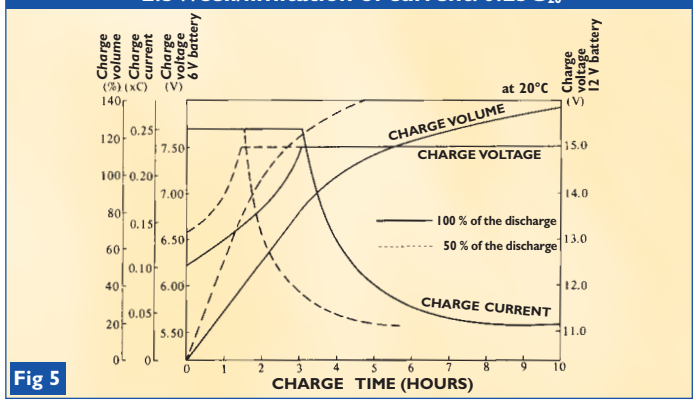


Fig 5

Temperature compensation

In order to optimise the service life of batteries, it is important to avoid all overcharge at high temperatures (risk of thermal runaway) or undercharge at low temperatures. Externally, for example, it is advised that the floating charge voltage be at –3mV/°C/cell for temperatures of more than 25°C and +3mV/°C/cell for temperatures of less than 15°C (central point 2.275V/cell at 20°C). For temperatures of more than 45°C, it is advised that the charge be stopped.

Noted that temperature sensor must be installed close to the batteries (consult Yuasa).

If the battery temperature is constant, (internally for example) and the charger has not been compensated, adjust the floating voltage in relation to the temperatures of the batteries.

Discharge

Determining your battery

To determine your batteries in relation to the power or discharge current (at 20 °C) and the expected autonomy, use the tables on pages 4, 5 and 6.

After any discharge, recharge your batteries as soon as possible.

Final discharge voltage / deep discharge

Fig 6 shows the evolution of battery voltage in relation to the regimes and discharge times (autonomy).

The dotted line indicates the minimum recommended discharge voltage. In order to avoid deep discharge and deterioration of the batteries by plate sulfation, do not go below this final voltage.

If the batteries are accidentally discharged below this limit, recharge them as soon as possible.

Discharge characteristic curves

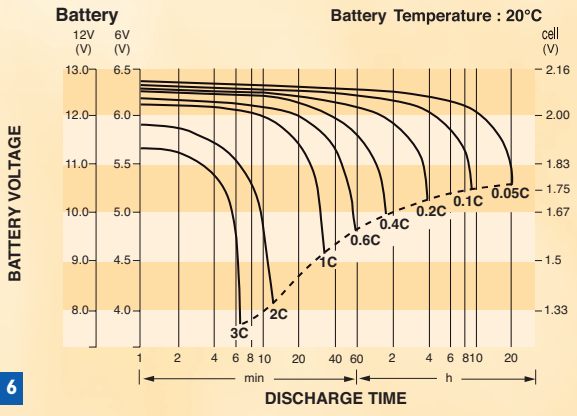


Fig 6

Discharge current	≤ 0,1 C	0,17 C	0,26 C	0,6 C	0,6 C à 3 C	> 3 C
Final voltage	1.75 V	1.7 V	1.67 V	1.6 V	1.5 V	1.3 V

Capacity and temperature

The capacity of the batteries evolves in relation to temperature. The table below indicates the correction coefficient for capacity in relation to temperature and to discharge autonomy. This should be taken into account when determining your batteries.

Ex : Capacity at 5°C for 35 mn autonomy = capacity at 20°C x 0,80 (same for current and power).

AUTONOMY (mn)	-20°C	-15°C	-10°C°	-5°C	0°C	+5°C	+10°C	+15°C	+20°C	+25°C	+30°C	+35°C	+40°C	+45°C	+50°C
1200	0,63	0,69	0,74	0,80	0,85	0,90	0,94	0,97	1,00	1,03	1,05	1,08	1,10	1,13	1,15
540	0,58	0,63	0,68	0,74	0,81	0,86	0,91	0,96	1,00	1,03	1,05	1,08	1,10	1,13	1,16
240	0,55	0,61	0,67	0,74	0,80	0,85	0,90	0,95	1,00	1,04	1,07	1,11	1,15	1,18	1,22
180	0,51	0,58	0,64	0,71	0,78	0,83	0,88	0,95	1,00	1,04	1,08	1,12	1,15	1,19	1,23
35	0,40	0,48	0,56	0,65	0,74	0,80	0,86	0,94	1,00	1,06	1,10	1,15	1,20	1,25	1,30
13	0,23	0,35	0,48	0,56	0,65	0,76	0,85	0,93	1,00	1,07	1,13	1,19	1,25	1,31	1,38
6	0,00	0,17	0,33	0,45	0,57	0,66	0,77	0,89	1,00	1,09	1,17	1,25	1,33	1,42	1,50

Self discharge

The self discharge level of SWL batteries is approximately 3% per month for storage at 20 °C. The self discharge level increases with high temperatures (see fig.7). Batteries should be stored in a dry place at an ambient temperature. To prevent any deterioration or any difficulty in recharging the battery, storage times should be limited.

The table below indicates maximum storage time in relation to temperature.

STORAGE TEMPERATURE	MAXIMUM STORAGE TIME
0° C to 25°C	12 months
25°C to 30°C	9 months
31°C to 40°C	5 months
41°C to 50°C	2.5 months

Once the storage limits have been reached, the batteries should be recharged at 2.4V/cell (current limited to $0.25C_{20}$) for 24 hours in order to compensate for the loss of capacity associated with the self discharge.

Self discharge

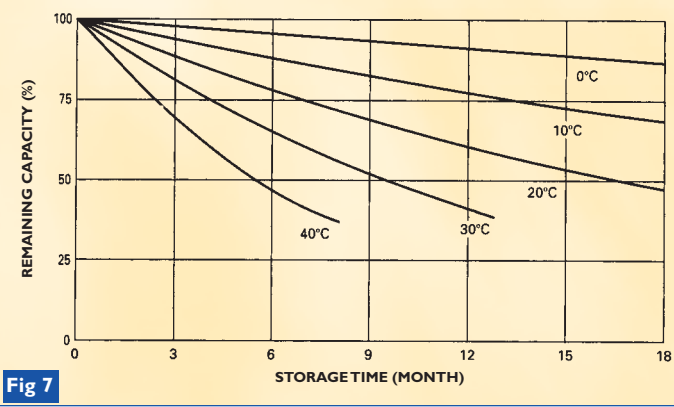


Fig 7

Open circuit voltage and remaining capacity

The remaining capacity of the batteries can be determined empirically by measuring its open circuit voltage after a minimum of 24 h rest (see fig.8).

Open circuit voltage and remaining capacity

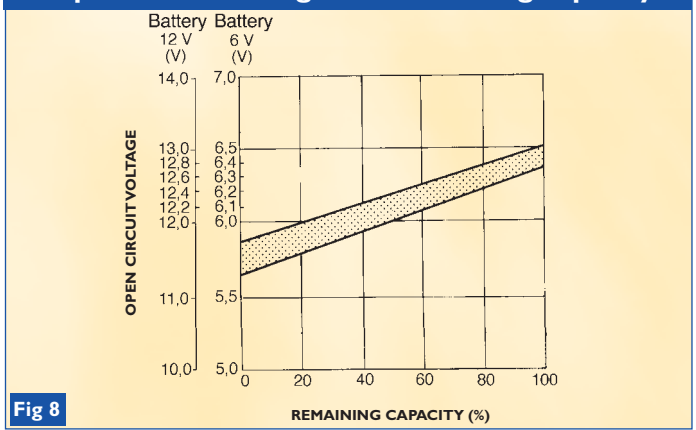


Fig 8

Service life in floating

The SWL type batteries are designed to work for 10 years in floating and normal usage conditions:

Floating voltage: 2.275V/cell (at 20°C).

Temperature less than or equal to 20°C.

Floating use (estimated discharged 100% every 3 months approx.).

For evolution of capacity over time, see fig.9.

It should be noted that the service life of the batteries is directly affected by:

- Batteries temperature, (see fig.10). The service life of batteries is divided by 2 for every band of 10 °C over 20°C. It should be noted that compensating for the floating voltage in relation to the temperature reduces the loss of service life by 20%.
- floating voltage (see fig.11).
- number of discharges
- depth of discharge and non respect of the final voltage.
- poor current charge quality.

Temperature

For the charge:
20°C advised, limit -15°C to +50°C.
For the discharge:
20°C advised, limit -15°C to +60°C.
For storage:
0 to 20°C advised, limit -20°C to +50°C.

Service life in floating at 20°C

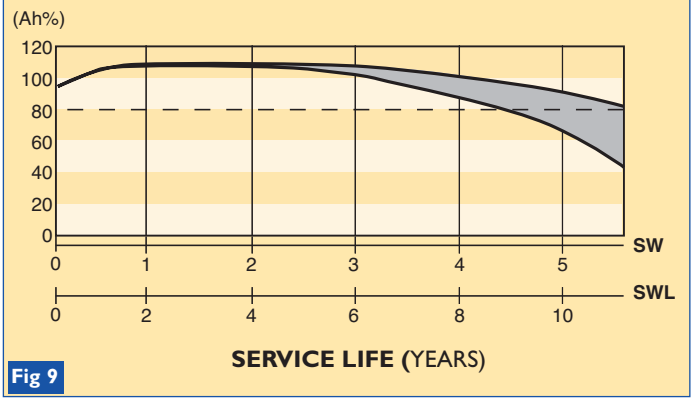


Fig 9

Service life and temperature

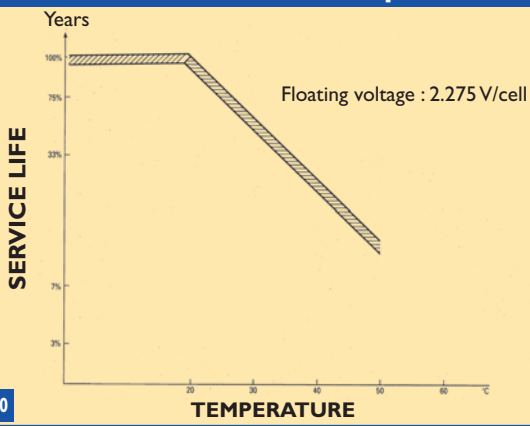


Fig 10

Service life and floating voltage

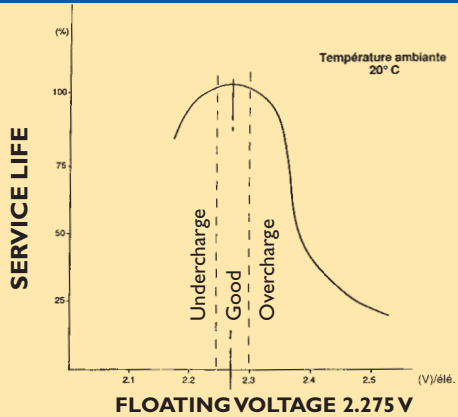


Fig 11

Standards

The SWL batteries:
Conform to or are compatible with the following standards: IEC60896-21/22, BS6290-4, UL94V0/HB, IEC61056 .
Referenced UL n°MH28018.
Manufactured with ISO9001 (2000) quality systems and ISO14001 environment management system.
Eurobat : 10-12 years (High Performance).
WEEE/ROHS : directives 2002/96/EC et 2002/95/EC, batteries excluded and subject to 91/157/EC.

Transport

IATA classification: class 8, group 3, UN2800 **A67** (non-dangerous material).

Environment

Recovery and recycling of used batteries in accordance with the governmental directives in force.

Rules of use

People handling the batteries must be authorised to work with electrical equipment (in accordance with the UTE C 18-510 in France or local equivalent standard).

The terminals must never be short-circuited. Insulated tools which meet applicable standards must be used.

The batteries must not be used in an enclosed space and natural ventilation is necessary, in accordance with the standard EN50272-2 or NFC15-100.

We recommend, a space of 5 to 10 mm must be left between the batteries for ventilation.

In order to connect several monoblocs, safety cabling must be used, avoiding any differences in potential close, and all risk of electric shock.

The section and length of the connectors must be appropriate to the maximum current.

Respect the tightening torque of the terminals (see page 3).

The batteries are delivered charged, but it is recommended that they be recharged in floating for 72 h before any discharge.

Don't fitt the batteries by the handles.

Service

Verify the cleanliness of the batteries and connectors.

Clean the batteries with a damp cloth. Do not use solvents.

Every three months, verify that the total voltage of the batteries is equal to 2.275V x N cells in series for a temperature of 20 °C.

Make an annual check of the individual voltage of each monobloc. Dispersion of + or – 2%, caused by gas recombination may be observed.

An autonomy test can be performed once a year, either by discharge or by measuring the impedances.

Installation

Our departments are at your disposal for any further information and proposals concerning:

Supplies of batteries assembled in cabinets or on metallic or wooden stands, with adapted connection equipment, accessories and plans of the wiring assembly.

On site assembly and wiring by qualified and authorised installers.

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