



STAND BY LEAD-ACID BATTERIES (OPzS Series)



IN GENERAL

Low Maintenance tubular, stand by batteries are a technically developed version of the common lead-acid stand by batteries. They have been specially designed and produced to operate under the floating voltage system with due regard for minimum maintenance and low energy cost considerations of the customer. Its basic characteristic is the low rate of self-discharge due to low antimony content in the lead alloy and hence the highly reduced rate of water loss. Its capability to save on the active material and its charge-discharge ability are equal.

The low maintenance, tubular stand by batteries (OPzS series) are manufactured in transparent containers. Their capacity ranges between 100 and 5000 amp-hours and they conform to the TSE and DIN standards. These batteries possess major advantages in regard to the aspects cited below.

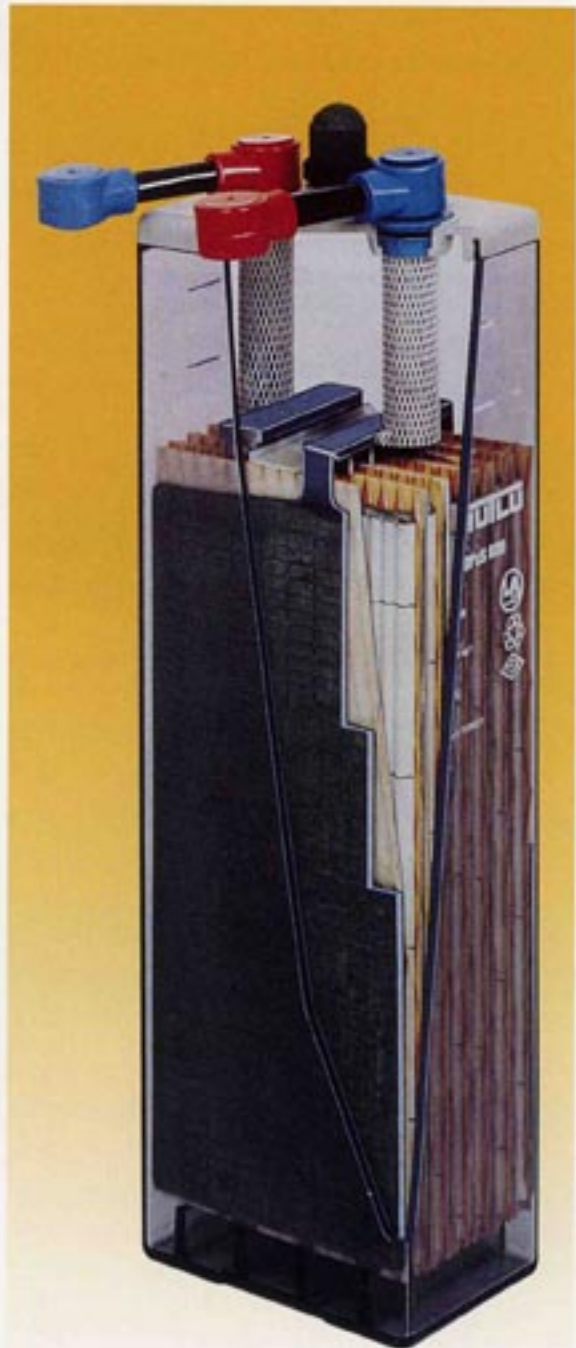
Easy install: They can be delivered either fully charged or dry charged. They possess properties of rapid and safe installation at a low cost, and minimum requirement for training.

Low Maintenance: They require no addition of distilled water for a period of 2-3 years under normal floating charge. The transparent plastic containers bear the min/max marks indicating the level of electrolyte.

Free of acid leak or spillage: The fusion mounted lid and the specially manufactured ceramic plugs prevent acid leak or spillage.

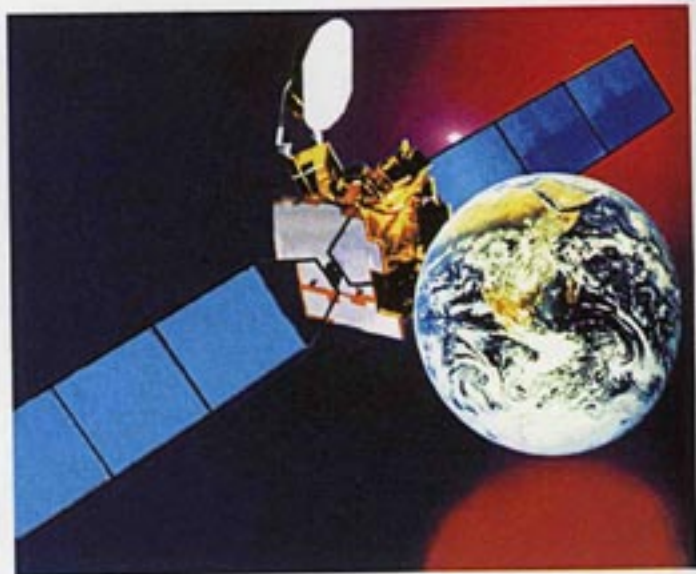
Long life span: They stand up to 1200-1500 charge-discharge cycles, and have a life of 10-15 years and more.

Service to suit the requirements: In all applications that require a discharge time over one hour, they are economically advantageous. Reinforced to suit the applications of discharge time, under one hour, we offer flat plated or block type, stand by batteries.



FIELDS OF APPLICATION

- Telephone exchanges (switching centers)
- Transformer centers, thermal, and hydroelectric power plants
- Uninterrupted power supplies
- Lighting for purposes of safety and similar reasons
- Power systems based on solar and wind energy
- Radio link systems
- Safety and monitoring systems



STRUCTURAL FEATURES

1- Electrodes (Plates):

Positive electrodes are manufactured tubular in form. Tubular positive plates have high capacity and a long life span. They consist of cylindrical polyester tubes attached to one another. Inside each tube is a lead rod made of a special alloy. These interconnected lead rods which have been manufactured automatically on highly special machinery by injection system, constitute the lead skeleton of the positive plate. In the space between the lead rods and the linings of the tubes, active material is injected automatically, homogeneously and in equal quantities. This technology is vital in securing durable, efficient and balanced operation of the battery. As a consequence, no disintegration of the active material is experienced during the normal life span of the battery; but at the same time the battery is rendered resistant against external effects. MUTLU has thus offered to costumers' service this series of durable and high capacity stand by batteries made of its special alloy, the powerful and high quality tube material imported from Europe and its active material produced by use of the latest technology.

Negative electrodes are flat in construction and carry on them a lead grid, which has been permeated with the active material by special machinery. Their properties are of a nature as to ensure their integrated operation with the tubular positive electrodes.

2- Separators:

Special high quality micro-porous separators are placed between the positive and negative plates. The most important properties of the separators used are their high porosity allowing for easy passage of the electrolyte, low electrical resistance and long life.

3- Electrolyte:

The electrolyte, which constitutes a mixture of sulphuric acid and distilled water, has a density of 1.24 Gr/cm³ at 20°C inside a fully charged battery.

4- Cell containers (Jars):

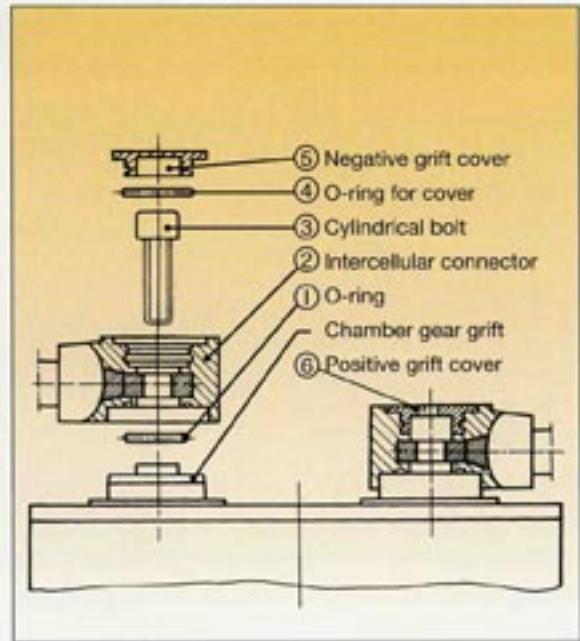
Cell containers are manufactured out of high quality, transparent plastic (SAN: Styrene-Acrylonitrile copolymer).

5- Vent plugs:

Due to the specially designed vent plugs, so that any acid droplets that might splash, return to the cell. Plugs allow easy discharge of the free oxygen and hydrogen formed and they are flameproof.

6- Cell outlets and their connections:

Cell outlets are made of lead-antimony alloy. The intercellular connections have been constructed so as to minimize resistance and thus reduce voltage drop. We offer different types of connections such as welded lead connectors and special cable connectors, as per requirement.



TECHNICAL SPECIFICATIONS

NOMINAL VOLTAGE

Nominal voltage per cell is 2 volts. Minimum during discharge is dependent upon the rate at which current is drawn. How this varies can be followed on the graphs.

CAPACITY

True capacity is represented by C_{10} . The current value is indicated over a discharge period of 10 hours at 20°C.

CHARGING

Floating charge:

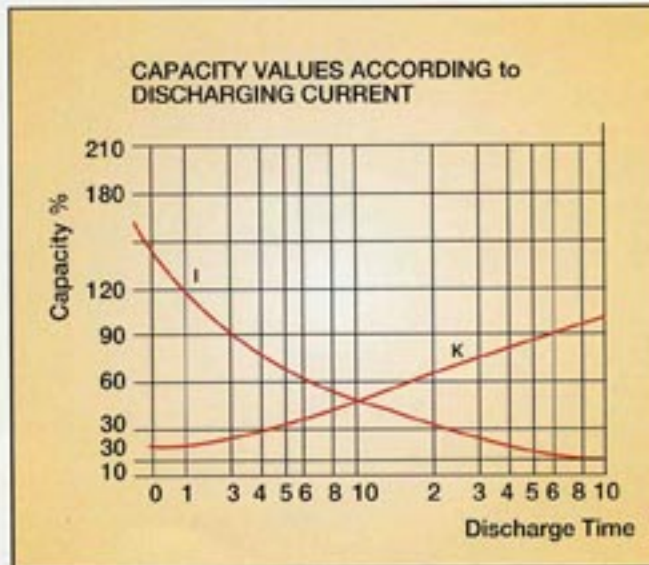
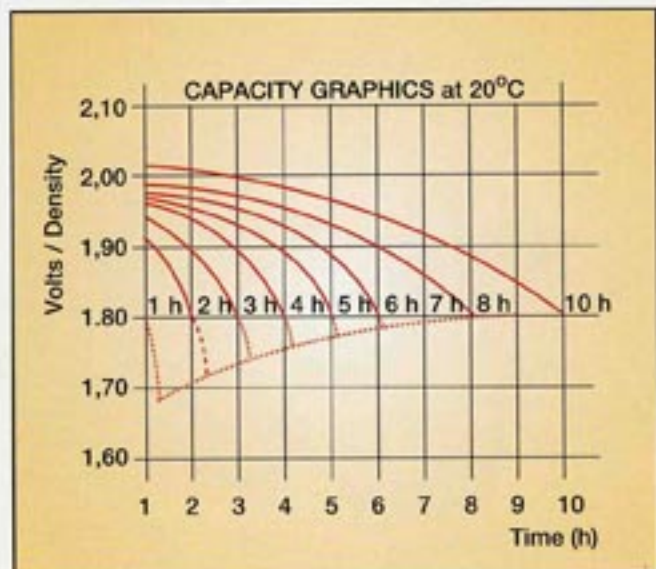
Floating charge is the safest way of keeping stand by facility batteries at the ready. In order to keep a batch of batteries ready for use, with no loss of voltage, they are kept under a floating charge of $2.23 \pm 1\%$ V/cell.

Accelerated charge:

There are various ways for charging. The generally employed method of charging is the IU system. In this system constant current is fed until voltage per cell reaches 2.34 - 2.40 after which the voltage is kept constant.

Maximum charging current:

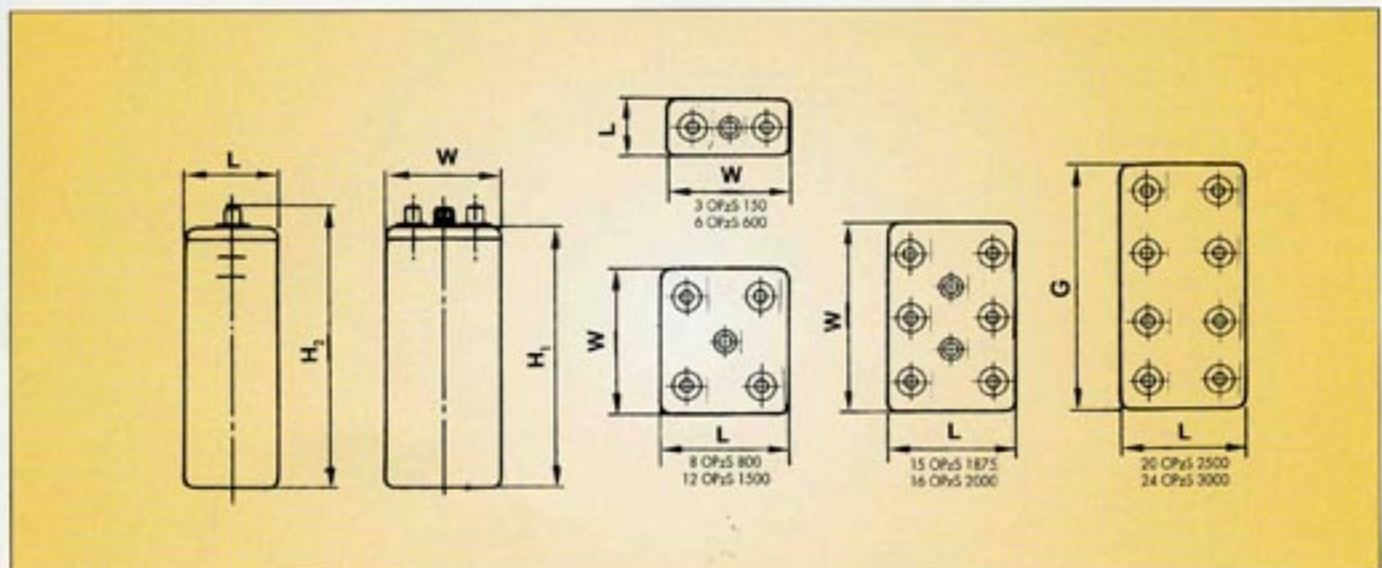
- 15 Amperes for every 100 Ampere-hours until 2.4 volts per cell is reached
- 5 Amperes for every 100 Ampere-hours over 2.4 volts per cell.



DIMENSIONS AND WEIGHTS OF OPzS SERIES STATIONARY BATTERIES

	TYPE	DIMENSIONS (Max.) mm				WEIGHT WITH ELECTROLYTE (Max)	ELECTROLYTE (1.24 Kg/l) Kg.	NUMBER OF POSITIVE TERMINALS	NUMBER OF VENT PLUGS
		L	W	H ₁	H ₂				
TRANSPARENT (SAN)	3 OPzS 150	105	208	360	420	15.9	4.6	1	1
	4 OPzS 200	105	208	360	420	18.0	4.4	1	1
	5 OPzS 250	126	208	360	420	21.4	6.4	1	1
	6 OPzS 300	147	208	360	420	25.0	5.8	1	1
	5 OPzS 350	126	208	475	535	29.0	7.3	1	1
	6 OPzS 420	147	208	475	535	33.8	9.0	1	1
	7 OPzS 490	168	208	475	535	39.6	10.7	1	1
	6 OPzS 600	147	208	650	725	48.0	12.9	1	1
	8 OPzS 800	215	193	650	725	66.0	16.7	2	1
	10 OPzS 1000	215	235	650	725	78.8	20.2	2	1
	12 OPzS 1200	215	277	650	725	93.0	23.7	2	1
	12 OPzS 1500	215	277	800	875	116.0	31.2	2	1
	15 OPzS 1875	215	400	775	850	153.0	51.0	3	2
	16 OPzS 2000	215	400	775	850	157.4	48.0	3	2
	20 OPzS 2500	215	490	775	850	208.6	65.0	4	3
24 OPzS 3000	215	580	775	850	246.0	76.0	4	3	

W= Width, L= Length, H₁=Height, H₂=Height including pole head.



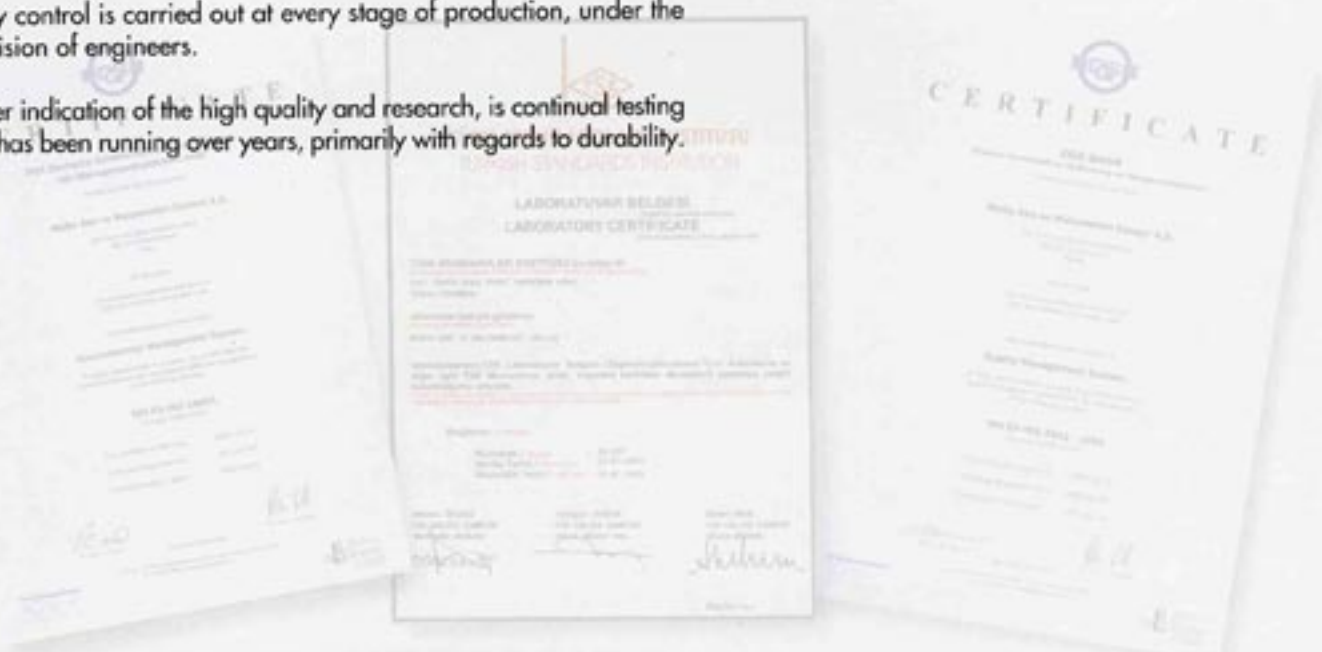


MODERN MANUFACTURING TECHNOLOGY AND CONTINUAL RESEARCH

The new, low maintenance, stand by tubular batteries are a product of modern technology and continual research. The production, which is realized by state-of-the-art machinery and mould designs imported from Europe, is kept under constant supervision at the physical and chemical laboratories capable of testing and controlling any material and battery.

Quality control is carried out at every stage of production, under the supervision of engineers.

Another indication of the high quality and research, is continual testing which has been running over years, primarily with regards to durability.



ISO 9001 INTERNATIONAL QUALITY SYSTEM CERTIFICATE

The fact that MUTLU has been awarded the international quality system certificates of ISO/TS 16949: 2002; DIN EN ISO 9001: 2000; as well as the certificate of conformity to DIN EN ISO 14001 is proof for the meticulous care exercised by MUTLU in production of batteries. This certificate is not only a proof of MUTLU's high quality; but also an indication of its recognition among the European countries. MUTLU enjoys the pride of being the first Turkish battery company to receive such a certificate.

MOUNTING OF STANDS

The cells are connected to one another on a mounting stand, to constitute the stand by battery. The stand acts as an insulator between the battery batch and the base. The stands are acid resistant and their insulating quality can be increased depending upon the location they are used at.

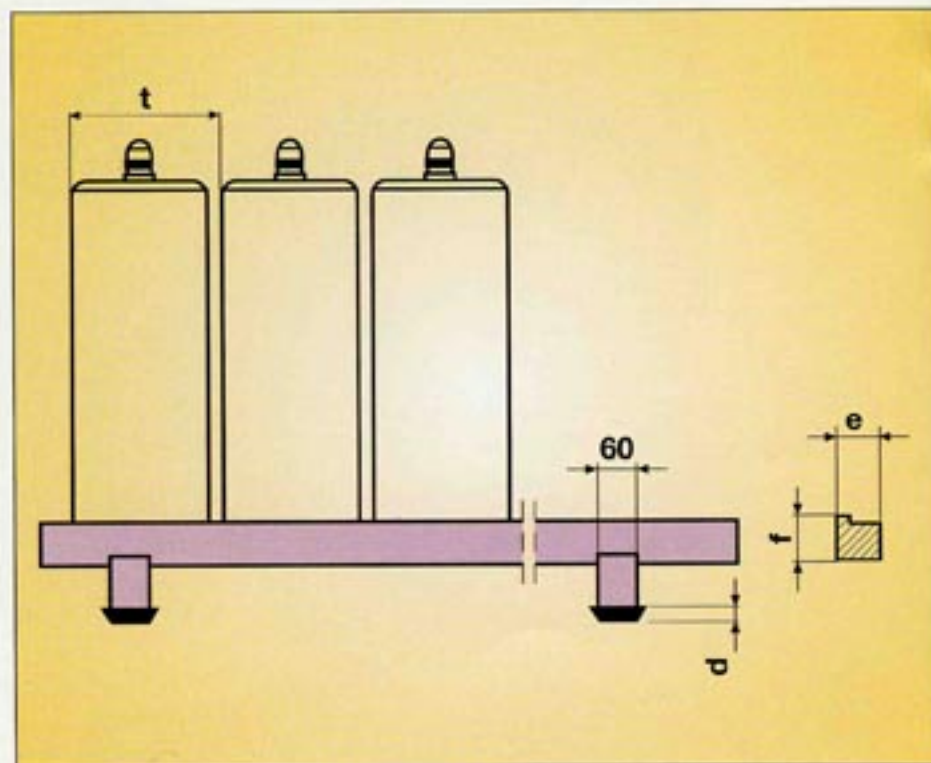
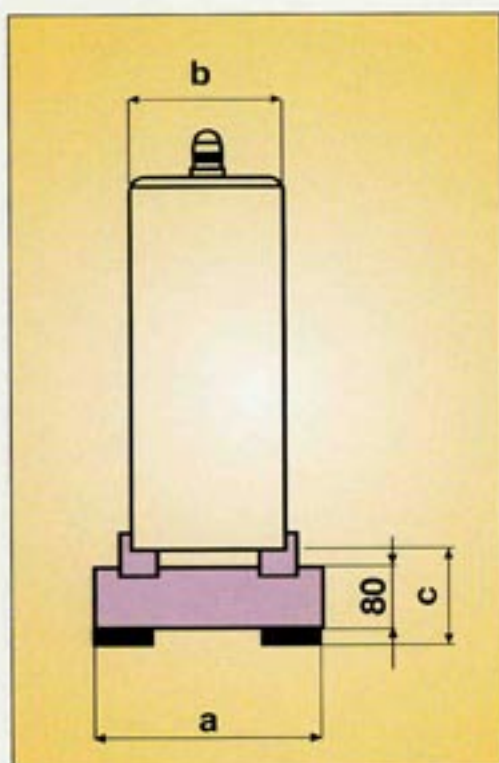
The specially selected timber is formed into stands at the "wood processing unit" and coated with acid resistant paint.

In addition to the flat types available, stands in echelon and multi-stage stands are manufactured, depending upon the space they are intended for.



TYPE	a	b	c	d	e	f	t
4 OPzS 200	300	208	120	20	50	50	123
5 OPzS 250							144
6 OPzS 300							165
5 OPzS 350	320	208	155	20	60	70	144
6 OPzS 420							165
7 OPzS 490							186
6 OPzS 600							165
8 OPzS 800	300	195	185	30	60	90	230
10 OPzS 1000	340	235					
12 OPzS 1200	390	275					
12 OPzS 1500							
16 OPzS 2000	496	400					
20 OPzS 2500	590	485					
24 OPzS 3000	677	578					

DETAIL DATA FOR SUB-FRAME



OPERATION

The proper floating voltage for high power, tubular stand by batteries is 2.23 volts per cell; that is to say, the voltage per cell should be between 2.20 and 2.25 volts. Internal losses of the battery are fully compensated by 2.23 volts. For floating voltages below this value, additional charging is needed occasionally. Floating voltages over 2.25 volts per cell, reduce the life of the battery group.

AN EXAMPLE FOR SELECTING THE PROPER BATTERY

A battery is required for supplying a continuous power at 60 volts. This battery must be capable of supplying direct current of 130 amperes continuously for an interval of two hours. The voltage is not to exceed 66.9 V and not to drop below 54 V. How many cells are required for this operation and what should be the capacity per cell?

The battery will not be off-loaded for recharging. Maximum cell voltage is 2.23; therefore, cells with a maximum charging voltage of 2.23 V are required.

$$\frac{V \text{ max.}}{V/\text{Cell}} = \frac{66.9 \text{ V}}{2.23 \text{ V}} = 30 \text{ cell}$$

The battery needed shall have 30 cells.

$$\frac{V \text{ min}}{\text{No. of cells}} = \frac{54 \text{ V}}{30 \text{ cells}} = 1.8 \text{ V/cell}$$

Now, from the table for the discharge voltage of 1.8 V, looking under the column of two hours, we arrive at a battery supplying 130 amperes.

SELECTION TABLE

U = 1.7 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	183	160.5	154	115	78	49	37	30	26	23	18	15
4 OPzS 200	244	214	205	154	104	65	50	41	35	30	24	20
5 OPzS 250	305	267.5	256	192	130	81	62	51	43	38	30	25
6 OPzS 300	360	321	307	204	156	97	75	61	52	45	36	30
5 OPzS 350	365	332.5	319	268	191	120	90	73	64	55	45	38
6 OPzS 420	438	399	383	322	229	144	108	88	76	66	54	45
7 OPzS 490	511	465.5	447	375	268	168	126	102	89	77	63	53
6 OPzS 600	579	540	528	426	318	202	151	123	105	90	73	61
8 OPzS 800	772	720	704	568	424	270	201	164	139	120	97	81
10 OPzS 1000	965	900	880	710	530	337	251	205	174	150	121	101
12 OPzS 1200	1128	1040	1020	852	636	405	301	246	209	180	145	121
12 OPzS 1500	1128	1056	1035	915	780	525	394	316	269	233	185	154
15 OPzS 1875	1410	1320	1294	1144	870	600	465	390	315	285	232.5	187.5
16 OPzS 2000	1504	1408	1380	1220	1040	699	525	421	359	311	247	205
20 OPzS 2500	1880	1760	1725	1525	1300	874	656	526	448	388	308	256
24 OPzS 3000	2256	2112	2070	1837	1560	1049	787	631	538	466	370	307

SELECTION TABLE

U = 1.75 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	154.5	139.5	137	105	75	49	37	30	26	23	18	15
4 OPzS 200	206	186	183	140	100	65	50	41	35	30	24	20
5 OPzS 250	257.5	232.5	228	175	125	81	63	51	43	38	30	25
6 OPzS 300	309	279	274	210	150	97	75	61	52	45	36	30
5 OPzS 350	310	290	284	244	180	120	90	73	64	55	45	38
6 OPzS 420	372	348	341	293	216	144	108	88	76	66	54	45
7 OPzS 490	434	406	398	342	252	168	126	102	89	77	63	53
6 OPzS 600	492	468	456	378	294	195	151	123	105	90	73	61
8 OPzS 800	656	624	608	504	392	260	201	164	139	120	97	81
10 OPzS 1000	820	780	760	630	490	325	251	205	174	150	121	101
12 OPzS 1200	984	936	912	756	588	390	301	246	209	180	145	121
12 OPzS 1500	960	900	877	794	708	498	382	312	269	233	185	154
15 OPzS 1875	1200	1125	1096	992	780	555	450	375	330	292.5	232.5	187.5
16 OPzS 2000	1280	1200	1169	1058	944	668	509	416	359	311	247	205
20 OPzS 2500	1600	1500	1461	1322	1180	830	636	520	448	388	308	256
24 OPzS 3000	1820	1800	1753	1586	1416	996	763	624	538	466	370	307

SELECTION TABLE

U = 1.8 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	127.5	119	117	95	69	46	36	30	26	23	18	15
4 OPzS 200	170	159	156	127	92	61	48	40	34	30	24	20
5 OPzS 250	212.5	199	195	158	115	77	60	50	43	38	30	25
6 OPzS 300	255	238	234	190	138	92	72	60	51	45	36	30
5 OPzS 350	260	238	233	216	164	111	86	71	62	54	44	37
6 OPzS 420	312	285	279	259	197	133	103	85	75	65	53	45
7 OPzS 490	364	332	325	303	230	156	121	99	87	76	62	52
6 OPzS 600	414	390	380	330	258	180	143	118	102	90	73	61
8 OPzS 800	552	520	500	440	344	240	191	158	136	119	97	81
10 OPzS 1000	690	650	630	550	430	300	238	197	170	149	121	101
12 OPzS 1200	828	750	730	660	516	360	286	237	204	179	145	121
12 OPzS 1500	828	750	730	660	591	456	355	295	256	225	181	153
15 OPzS 1875	1035	930	902	846	760	570	444	369	320	280	227	190
16 OPzS 2000	1104	992	962	875	788	608	474	394	341	299	242	203
20 OPzS 2500	1380	1240	1203	1095	986	760	592	492	426	374	302	254
24 OPzS 3000	1656	1488	1443	1313	1182	912	711	591	511	449	363	305

SELECTION TABLE

U = 1.83 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	111	103	101	87	65	44	34	29	24	22	18	15
4 OPzS 200	148	138	135	116	86	59	46	38	33	29	23	20
5 OPzS 250	185	172	169	145	108	73	57	48	41	36	29	25
6 OPzS 300	225	205	201	174	129	88	69	57	49	43	35	30
5 OPzS 350	225	205	202	195	152	105	82	67	59	52	43	36
6 OPzS 420	273	246	241	234	183	126	98	81	71	62	51	43
7 OPzS 490	318	287	281	273	213	147	114	94	83	72	60	51
6 OPzS 600	366	339	312	294	234	171	136	114	97	86	70	59
8 OPzS 800	488	452	416	392	312	228	181	152	130	115	93	79
10 OPzS 1000	610	565	520	490	390	285	226	190	162	143	116	98
12 OPzS 1200	732	650	624	588	468	342	271	228	195	172	139	118
12 OPzS 1500	720	640	624	593	564	423	334	280	244	215	175	148
15 OPzS 1875	900	795	780	741	705	528	417	350	305	269	219	185
16 OPzS 2000	960	848	832	790	752	563	445	373	325	287	234	197
20 OPzS 2500	1200	1060	1040	988	940	704	556	466	406	358	292	246
24 OPzS 3000	1440	1272	1248	1186	1128	845	667	559	487	430	351	295

SELECTION TABLE

U = 1.87 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	96	88	88	73	57	40	32	27	23	21	17	14
4 OPzS 200	128	118	117	98	76	53	42	35	31	27	22	19
5 OPzS 250	160	148	146	122	95	66	53	44	38	34	28	24
6 OPzS 300	192	177	175	147	114	79	63	53	46	41	33	28
5 OPzS 350	193	177	175	164	130	94	74	61	54	48	40	34
6 OPzS 420	231	207	210	197	156	113	89	73	64	57	48	41
7 OPzS 490	270	242	245	230	182	132	104	85	75	67	55	48
6 OPzS 600	324	285	240	233	201	153	124	104	90	80	64	56
8 OPzS 800	432	380	320	310	268	204	165	139	120	107	86	75
10 OPzS 1000	540	475	400	388	335	255	206	173	150	133	107	93
12 OPzS 1200	648	570	480	466	402	306	247	208	180	160	129	112
12 OPzS 1500	612	540	480	466	452	369	295	255	222	198	162	139
15 OPzS 1875	765	675	600	582	565	460	369	318	278	248	203	174
16 OPzS 2000	816	720	640	621	602	491	394	339	296	264	216	186
20 OPzS 2500	1020	900	800	776	753	614	492	424	370	330	270	232
24 OPzS 3000	1224	1080	960	931	903	737	591	509	444	396	324	279

SELECTION TABLE

U = 1.9 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	81	72	69	63	51	36	29	24	21	19	16	14
4 OPzS 200	108	96	92	83	68	48	38	32	28	25	21	18
5 OPzS 250	135	120	115	104	85	60	48	40	35	32	26	23
6 OPzS 300	162	144	138	125	102	72	57	48	42	38	31	27
5 OPzS 350	150	143	125	125	115	83	67	55	49	44	37	33
6 OPzS 420	180	171	150	150	138	100	80	66	58	52	44	40
7 OPzS 490	210	200	175	175	161	116	93	77	68	61	51	46
6 OPzS 600	264	231	192	192	177	138	112	94	82	73	61	54
8 OPzS 800	352	308	256	256	236	184	149	126	109	98	81	71
10 OPzS 1000	440	385	320	320	295	230	186	157	136	122	101	89
12 OPzS 1200	528	462	384	384	354	276	223	189	163	147	121	107
12 OPzS 1500	516	456	379	360	342	318	259	228	198	177	145	126
15 OPzS 1875	645	570	473	450	427	398	324	285	248	220	182	158
16 OPzS 2000	688	608	505	480	456	424	346	304	264	235	194	168
20 OPzS 2500	860	760	631	600	570	530	432	380	330	294	242	210
24 OPzS 3000	1032	912	757	720	684	636	519	456	396	353	291	252

SELECTION TABLE

U = 1.87 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	96	88	88	73	57	40	32	27	23	21	17	14
4 OPzS 200	128	118	117	98	76	53	42	35	31	27	22	19
5 OPzS 250	160	148	146	122	95	66	53	44	38	34	28	24
6 OPzS 300	192	177	175	147	114	79	63	53	46	41	33	28
5 OPzS 350	193	177	175	164	130	94	74	61	54	48	40	34
6 OPzS 420	231	207	210	197	156	113	89	73	64	57	48	41
7 OPzS 490	270	242	245	230	182	132	104	85	75	67	55	48
6 OPzS 600	324	285	240	233	201	153	124	104	90	80	64	56
8 OPzS 800	432	380	320	310	268	204	165	139	120	107	86	75
10 OPzS 1000	540	475	400	388	335	255	206	173	150	133	107	93
12 OPzS 1200	648	570	480	466	402	306	247	208	180	160	129	112
12 OPzS 1500	612	540	480	466	452	369	295	255	222	198	162	139
15 OPzS 1875	765	675	600	582	565	460	369	318	278	248	203	174
16 OPzS 2000	816	720	640	621	602	491	394	339	296	264	216	186
20 OPzS 2500	1020	900	800	776	753	614	492	424	370	330	270	232
24 OPzS 3000	1224	1080	960	931	903	737	591	509	444	396	324	279

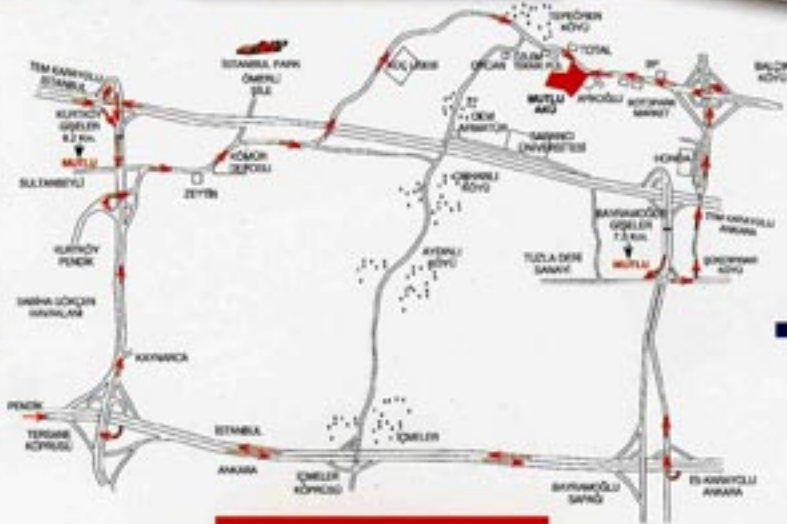
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U = 1.9 V/Cell Discharge Current (A)

TYPE	5 min.	10 min.	15 min.	30 min.	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
3 OPzS 150	81	72	69	63	51	36	29	24	21	19	16	14
4 OPzS 200	108	96	92	83	68	48	38	32	28	25	21	18
5 OPzS 250	135	120	115	104	85	60	48	40	35	32	26	23
6 OPzS 300	162	144	138	125	102	72	57	48	42	38	31	27
5 OPzS 350	150	143	125	125	115	83	67	55	49	44	37	33
6 OPzS 420	180	171	150	150	138	100	80	66	58	52	44	40
7 OPzS 490	210	200	175	175	161	116	93	77	68	61	51	46
6 OPzS 600	264	231	192	192	177	138	112	94	82	73	61	54
8 OPzS 800	352	308	256	256	236	184	149	126	109	98	81	71
10 OPzS 1000	440	385	320	320	295	230	186	157	136	122	101	89
12 OPzS 1200	528	462	384	384	354	276	223	189	163	147	121	107
12 OPzS 1500	516	456	379	360	342	318	259	228	198	177	145	126
15 OPzS 1875	645	570	473	450	427	398	324	285	248	220	182	158
16 OPzS 2000	688	608	505	480	456	424	346	304	264	235	194	168
20 OPzS 2500	860	760	631	600	570	530	432	380	330	294	242	210
24 OPzS 3000	1032	912	757	720	684	636	519	456	396	353	291	252



KURUMU ÖZİNGİNİ TİMÇİ EDİLECEK TABELALAR
 1) TÜRKİYE - ÖZİNGİNİ SAKLIYI
 2) ÖZİNGİNİ SAKLIYI
 3) ÖZİNGİNİ SAKLIYI
 4) ÖZİNGİNİ SAKLIYI



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