Energy *in motion*

TAB TOPzS

Low maintenance TAB TOPzS vented stationary batteries

Let us lead you into the world of everlasting energy and introduce you with TOPzS stationary cells produced in the improved lead-acid technology.

The batteries are distinguished for:

- high capacity,
- long life time,
- reduced maintenance,
- low self-discharging,
- quick and simple acid level control,
- economical water consumption,
- appropriate dimensions and weight,
- the lowest and constant maintenance current.

The stationary batteries of the type TOPzS are manufactured according to the DIN 40736, EN 60896 and IEC 896-1 regulations. Individual cells (2V) are made from translucent PP containers.

Application

Stationary batteries of the TOPzS type are specially designed for solar systems. Due to their extremely low self-discharging and tubular positive plates they are suitable for off-grid solar systems.

Construction

The positive armoured plate is of a tubular type, which means that the active substance (PbO_2) is contained in special gauntlet made of polyester fibres and hardened by an impregnation compound. Such construction prevents escaping of an active substance during the operation and ensures a long life time. The grids are made of special low percentage (less than 2%) antimony alloy with addition agents for improvement of crystalline structure of casting. Negative plates are pasted-type plates with special additives maintaining porosity of an active substance during the operation. As an electrolyte, a diluted sulphuric acid (H_2SO_4) with a density of 1.24 ± 0.01 kg/l at 20 degrees C , and at a maximum permitted level is used. Separators separating the positive plates from the negative ones are made of microporous plastic material with a low electric resistance.

In a special process, the lids are tightly sealed with thermo welding to the container. The terminal plugs are sealed with rubber seals. This prevents any escape of electrolyte from the cells.
Due to the transparent containers the electrolyte level is clearly visible, the maximum and minimum levels are marked on a self-adhesive acid-proof label on a container side.
Two versions of batteries are being manufactured:

a) Dry-charge version:
battery has to be filled up with an electrolyte and supplementary charged before use. The plates are already formed and in a special process protected against oxidation. They can be stored without problems.

b) Electrolyte-charge:
battery can be installed immediately, because it is already filled up with electrolyte and electrically charged as well.

Operation-maintenance

For more detail information please check our operation manual.

Technical specifications

Cell Type	L (mm)	W (mm)	H (mm)	Weight Dry (kg)	Weight Wet (kg)	C10 (Ah)	C100 (Ah)
3 TOPzS 265	198	83	472	12,4	18,4	265	345
4 TOPzS 353	198	101	472	16,0	23,3	353	458
5 TOPzS 442	198	119	472	20,2	29,0	442	575
4 TOPzS 500	198	101	720	24,3	35,2	500	650
5 TOPzS 625	198	119	720	30,3	43,2	625	812
6 TOPzS 750	198	137	720	38,0	53,5	750	975
7 TOPzS 875	198	173	720	44,0	64,2	875	1137
8 TOPzS 1000	198	191	720	50,2	72,5	1000	1300

Electrolyte density: 1,24 kg/l at 20 °C

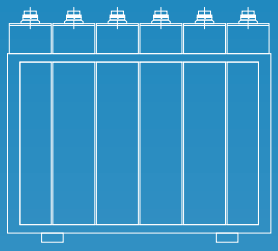
TAB
Tovarna akumulatorskih baterij, d.d.
Mežica - Slovenija

TAB

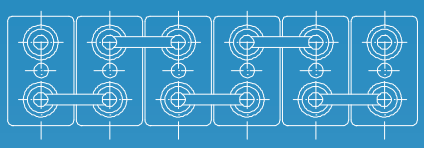
Tovarna akumulatorskih baterij, d.d.
Mežica - Slovenija

Technical Specification

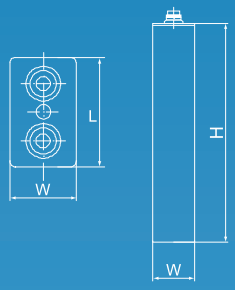
Design	
positive electrode	tubular positive plate plate with low antimony alloy (<2%)
negative electrode	flat plate with long life expander
separation	microporous separator
electrolyte	sulphuric acid of 1,24 kg/l,
container	transparent PP containers
lid	PP in green colour
pole sealing	100% gas-and electrolyte-tight rubber seal
kind of pole	M10, brass insert
connector	flexible insulated copper cables with cross-section of 35, 50 or 70mm2
pole screw	M10, steel, insulated
Charging	
IU - characteristic	Imax without limitation
Float voltage	U = 2,23 V/cell +/- 1%
boost charge	U = 2,35 to 2,40V/cell, time limited
charging time up to 92%	6h with 1,5*I10 initial current, 2.23 V/cell, 50% C10 discharged
Discharge characteristics	
reference temperature	20°C at C10 (1,80 V/cell) and 25°C at C100 (1,85 V/cell)
initial capacity	100%
depth of discharge	normally up to 80%
depth of discharges	more than 80% DOD or discharges beyond final discharge voltages (dependent on discharge current) have to be avoided
Maintenance	
every 6 month	check battery voltage, pilot cell voltage, temperature
every 12 month	take down battery voltage, cell voltage, temperature
Operational data	
operational life	up to 15 years
IEC 896-1 cycles	1200
self-discharge	approx. 3% per month at 20°C
operational temperature	-20°C to 55°C, recommended 10°C to 30°C
tests according	IEC 896-1, EN 60896-1, EN 61427
safety standard, ventilation	EN 50272-2
transport	batteries are not subject to ADR (road transport)



Connections



Dimensions



Certificate of Approval

Awarded to

Tovarna Akumulatorskih Baterij
Mežica Slovenija

ISO 14001 BUREAU VERITAS Certification

ISO 9001 BUREAU VERITAS Certification

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1,70V/cell disc.(A)				1,24kg/l		20°C						
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	229	188	141	91	68	55	47	40	33	27	15	3,61
4 TOPzS 353	305	251	188	121	91	73	63	53	44	36	20	4,81
5 TOPzS 442	382	314	236	152	114	92	79	67	55	46	25	6,02
4 TOPzS 500	432	355	267	172	128	104	89	76	62	52	28	6,81
5 TOPzS 625	540	444	333	214	161	130	112	94	78	65	35	8,51
6 TOPzS 750	648	533	400	257	193	156	134	113	93	77	42	10,21
7 TOPzS 875	756	622	466	300	225	182	156	132	109	90	49	11,91
8 TOPzS 1000	865	711	533	343	257	208	179	151	124	103	56	13,62

1,75V/cell disc.(A)												
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20h**	**100 h**
3 TOPzS 265	200	168	132	87	66	54	46	39	32	27	15	3,57
4 TOPzS 353	267	223	176	116	88	72	61	51	43	36	20	4,75
5 TOPzS 442	334	280	220	145	111	90	77	64	53	45	24	5,95
4 TOPzS 500	378	316	249	164	125	102	87	73	60	51	28	6,73
5 TOPzS 625	473	396	311	205	157	128	108	91	75	64	35	8,41
6 TOPzS 750	567	475	373	246	188	153	130	109	90	77	42	10,09
7 TOPzS 875	662	554	435	287	219	179	152	127	105	89	48	11,77
8 TOPzS 1000	757	633	497	328	250	205	173	145	120	102	55	13,45

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1,80V/cell disc.(A)				1,24kg/l		20°C						
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	169	145	116	80	63	52	45	38	32	26	14	3,51
4 TOPzS 353	225	193	155	107	84	69	60	51	42	35	19	4,67
5 TOPzS 442	282	242	194	134	105	87	75	64	53	44	24	5,85
4 TOPzS 500	318	273	219	152	119	98	85	72	60	50	27	6,62
5 TOPzS 625	398	342	274	190	148	123	106	90	75	62	34	8,27
6 TOPzS 750	478	410	328	227	178	147	127	108	90	75	41	9,93
7 TOPzS 875	557	479	383	265	208	172	148	126	105	87	48	11,58
8 TOPzS 1000	637	547	438	303	237	197	169	145	120	100	54	13,24

1,83V/cell disc.(A)												
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	141	128	105	75	59	49	42	37	30	26	14	3,44
4 TOPzS 353	188	171	139	100	79	66	57	49	41	34	19	4,58
5 TOPzS 442	236	213	174	125	98	83	71	61	51	43	24	5,74
4 TOPzS 500	267	242	197	142	111	93	80	69	58	49	27	6,49
5 TOPzS 625	334	302	247	177	139	117	100	86	72	61	33	8,12
6 TOPzS 750	400	362	296	212	167	140	120	103	86	73	40	9,74
7 TOPzS 875	467	423	345	248	195	163	140	121	101	85	47	11,36
8 TOPzS 1000	534	483	395	283	223	187	160	138	115	97	53	12,99

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1,87V/cell disc.(A)				1,24kg/l		20°C					
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	111	105	89	66	53	45	39	34	28	24	14	3,32
4 TOPzS 353	148	139	118	88	71	60	52	45	37	32	18	4,43
5 TOPzS 442	186	174	148	110	88	75	65	56	47	40	23	5,54
4 TOPzS 500	210	197	167	124	100	85	74	63	53	45	26	6,27
5 TOPzS 625	263	247	209	155	125	106	92	79	66	57	32	7,84
6 TOPzS 750	315	296	251	186	150	127	111	95	79	68	39	9,41
7 TOPzS 875	368	345	292	217	175	148	129	111	93	80	45	10,97
8 TOPzS 1000	420	395	334	249	200	169	147	127	106	91	52	12,54

1,90V/cell disc.(A)												
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	86	83	76	57	46	39	34	31	25	22	13	3,20
4 TOPzS 353	114	110	101	77	62	53	46	41	34	29	18	4,27
5 TOPzS 442	143	138	127	96	78	66	57	51	42	37	22	5,34
4 TOPzS 500	161	156	143	108	88	74	65	58	48	42	25	6,04
5 TOPzS 625	202	195	179	136	110	93	81	72	60	52	31	7,55
6 TOPzS 750	242	234	215	163	132	112	97	87	72	63	37	9,06
7 TOPzS 875	283	272	251	190	153	130	113	101	83	73	43	10,57
8 TOPzS 1000	323	311	287	217	175	149	129	115	95	83	50	12,08

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1,70V/cell	power W/cell			1,24kg/l		20°C					
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	399	335	254	167	126	103	89	75	63	52	28	6,86
4 TOPzS 353	531	447	339	223	168	137	119	100	84	69	38	9,13
5 TOPzS 442	665	559	424	279	210	171	149	126	105	87	47	11,43
4 TOPzS 500	752	633	480	316	238	194	168	142	119	98	53	12,94
5 TOPzS 625	940	791	600	395	297	242	210	178	149	123	67	16,17
6 TOPzS 750	1128	949	720	474	357	290	252	213	179	147	80	19,40
7 TOPzS 875	1316	1107	840	552	416	339	294	249	208	172	93	22,64
8 TOPzS 1000	1504	1265	960	631	475	387	336	284	238	196	106	25,87

1,75V/cell	power W/cell			1,24kg/l		20°C					
Cell Type	**15 min**	**30 min**	**1 h**	**2h**	**3 h**	**4 h**	**5 h**	**6h**	**8 h**	**10 h**	**20 h**	**100 h**
3 TOPzS 265	357	302	240	161	123	101	86	73	61	51	29	6,95
4 TOPzS 353	475	402	320	214	164	135	115	97	81	68	38	9,26
5 TOPzS 442	595	504	400	268	206	169	144	121	102	86	48	11,60
4 TOPzS 500	673	570	453	303	233	191	163	137	115	97	54	13,12
5 TOPzS 625	842	712	566	379	291	239	204	172	144	121	67	16,40
6 TOPzS 750	1010	854	679	455	349	287	244	206	173	145	81	19,68
7 TOPzS 875	1178	997	792	531	408	335	285	240	201	170	94	22,96
8 TOPzS 1000	1347	1139	905	607	466	383	326	275	230	194	108	26,24

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1,80V/cell	power W/cell			1,24kg/l		20°C					
Cell Type	15 min	30 min	1 h	2h	3 h	4 h	5 h	6h	8 h	10 h	20 h	100 h
3 TOPzS 265	307	265	214	149	118	98	85	73	61	51	28	6,88
4 TOPzS 353	409	353	284	199	158	131	113	97	81	68	38	9,16
5 TOPzS 442	512	442	356	249	197	164	141	121	102	85	47	11,47
4 TOPzS 500	580	500	403	282	223	186	160	137	115	96	53	12,97
5 TOPzS 625	725	626	504	353	279	232	200	172	144	120	67	16,22
6 TOPzS 750	869	751	604	423	335	279	240	206	173	144	80	19,46
7 TOPzS 875	1014	876	705	494	391	325	280	240	201	168	93	22,70
8 TOPzS 1000	1159	1001	806	564	446	372	320	275	230	192	107	25,95

1,83V/cell	power W/cell			1,24kg/l		20°C					
Cell Type	15 min	30 min	1 h	2h	3 h	4 h	5 h	6h	8 h	10 h	20 h	100 h
3 TOPzS 265	260	238	193	141	112	94	81	70	59	50	28	6,74
4 TOPzS 353	347	317	258	188	149	125	108	93	78	66	37	8,98
5 TOPzS 442	434	397	323	235	187	157	135	117	98	83	46	11,25
4 TOPzS 500	491	449	365	266	212	177	153	132	111	94	52	12,73
5 TOPzS 625	614	561	456	333	265	222	191	165	139	117	65	15,91
6 TOPzS 750	737	674	547	399	318	266	230	198	167	140	79	19,09
7 TOPzS 875	859	786	639	466	370	310	268	232	194	164	92	22,27
8 TOPzS 1000	982	898	730	532	423	355	306	265	222	187	105	25,45

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1,87V/cell	power W/cell			1,24kg/l		20°C					
Cell Type	15 min	30 min	1 h	2h	3 h	4 h	5 h	6h	8 h	10 h	20 h	100 h
3 TOPzS 265	210	198	168	126	102	87	76	65	55	47	27	6,51
4 TOPzS 353	280	263	224	168	136	116	101	87	73	63	36	8,68
5 TOPzS 442	351	330	281	210	170	145	126	109	91	79	45	10,87
4 TOPzS 500	397	373	318	237	192	164	143	123	103	89	51	12,29
5 TOPzS 625	496	466	397	297	240	205	179	154	129	111	63	15,36
6 TOPzS 750	596	559	476	356	288	246	215	184	155	134	76	18,44
7 TOPzS 875	695	653	556	415	336	287	250	215	180	156	88	21,51
8 TOPzS 1000	794	746	635	475	384	328	286	246	206	178	101	24,58

1,90V/cell	power W/cell			1,24kg/l		20°C					
Cell Type	15 min	30 min	1 h	2h	3 h	4 h	5 h	6h	8 h	10 h	20 h	100 h
3 TOPzS 265	163	158	146	111	90	77	66	60	49	44	26	6,37
4 TOPzS 353	217	210	194	148	120	103	89	79	66	58	35	8,49
5 TOPzS 442	271	263	243	185	150	128	111	99	82	73	44	10,63
4 TOPzS 500	307	297	275	209	170	145	125	113	93	82	49	12,02
5 TOPzS 625	384	372	344	262	213	182	157	141	116	103	62	15,03
6 TOPzS 750	460	446	413	314	255	218	188	169	140	123	74	18,04
7 TOPzS 875	537	520	481	366	298	254	219	197	163	144	87	21,04
8 TOPzS 1000	614	595	550	419	340	290	251	225	186	164	99	24,05

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OPERATING INSTRUCTIONS

for stationary vented lead-acid OPzS, SPgBG, OGi, UPS and SOLAR (TOPzS) batteries

Nominal data:
Nominal voltage UN : 2.0 V x number of cells
Nominal capacity CN = C10: 10-hour discharge (see plate type)
Nominal discharge current: IN = 110= CN /10
Final discharge voltage Us: 1,80V/cell
Nominal temperature TN: 20°C
"LA"antimony content: < 2% in the grids
Nominal S.G. of electrolyte: 1,24 +/- 0,01 kg/l

Bat. Type: _____
Assembled by: _____
Date: _____
Start-up by:_____
Date:_____

Observe operating instructions and affix close within sight of the battery! Work on batteries only under instructions of skilled personel!

Smoking prohibited! Do not expose battery to open flame, glowing fire or sparks as explosion and fire hazard exists!

When working on batteries wear protective glasses and clothing!

Explosion and fire hazard! Avoid short circuits!
Caution! Metal parts of the battery cells are always live, therefore do not place items or tools on the battery!

Electrolyte is strongly corrosive!

Monoblock batteries / cells are very heavy! Ensure secure installation! Only use suitable transport equipment!

Dangerous voltage!

Acid splashes in the eyes or on the skin must be washed out or off with plenty of water. Then see a doctor immediately. Acid on clothing should be washed out with water!

Safety requirements according to EN 50272-3.

Non-compliance with operating instructions, repairs made with other than original parts, use of additives for the electrolyte (alleged "enhancing agents") render the warranty null and void.

1. Commissioning

a) Filled and charged batteries

Before commissioning all blocks must be inspected for mechanical damage, cells must be connected with the correct polarity and connectors firmly seated. The following torque apply for M10 screw connectors is:

20 ± 1 Nm

If necessary the terminal covers must be put on. Check the electroiyte level in all cells. If necessary top up to maximum level with purified water as under DIN 43530 Part 4.
Before putting the battery in operation, plastic transport vent caps must be removed and replaced with ceramic cell plugs.
With charger off and loads isolated connect battery to the direct current power supplies maintaining correct polarity (positive terminal to positive post).
Switch on the charger and charge as under section 2.2.

b) Dry charged (DC) batteries

Instructions for the initial charging of a dry charged stationary OPzS and SOLAR (TOPzS) batteries:

- Unscrew the sealed vent plugs and fill the cells with pure dilute sulphuric acid, specific gravity 1,230 0,01kg/1 read at 20 (68 F), up to about 25 mm below top of lid for SPgBG multi-block hard rubber containers and 50 mm below of lid for OPzS translucent containers or max level marked on the label. The temperature of the filling acid should be between 10°C and 25°C (50 - 77 F).
- Insert the original plastic vent plug with removed sealing foil on the top or place the special ceramic vent plug.
- Start charging for not less than 2 and not more than 12 hours elapsed after the last cell has been filled with the acid.
- Apply the 0,5 x 110(5A/100Ah) current.
- Charge for 8 hours and then keep the battery on open circuit for 1-2 hours.
- Continue the charging for a few hours, until the battery is fully charged, i.e. until constant voltage and constant specific gravity have been reached. The specific gravity of the acid in a fully charged celi is 1,240 0,01 kg/l read at 20°C (68 F), If during the charging the temperature of the acid exceeds 55°C (131 F) reduce the charging current by 50%.
- 0,5 h after charging discharge the battery at 10 hour rate of current until the cell voltage drops to average value 1.80 Volts. Allowable minimum voltage of a single cell is 1,70V.
- Recharge the battery according to the operating instructions 2.2.
- 24 hours after recharging adjust electrolyte level to the "max" mark on the label. Activation and test results must be kept as part of battery documentation. Non-compliance with this request renders the warranty null and void.

2. Operation

For the operation of stationary battery, installation s EN 50272-2 apply

2.1 Discharging

Never allow the final discharge voltage of the battery to drop below that assigned for the discharge current. Charge immediately after discharge as well as partial discharge. Recommended DOD (Depth Of Discharge) for normal operating is up to 80% of CN.

2.2 Charging

All charging procedures with their limit values may be employed as stated below:
DIN 41773 (IU characteristic)
DIN 41774 (W characteristic)
DIN 41776 (I characteristic).
Depending on charger type and charging characteristic alternating currents flow through the battery superimposing onto the direct current. These alternating currents and the reaction of the loads lead to an additional warming of the battery and strain on the electrodes with possible resulting damage (see 2.5). Depending on the system at hand, charging may be carried out under the following modes:

a) Stand-by parallel operation and floating operation.
Here the load, direct current and battery are continuously connected in parallel. There by the charging voltage is at the same time the operating voltage of the system.
With stand-by-parallel operation the direct current is at any time capable of supplying the maximum load current and the battery charging current. The battery only supplies current when the direct current source fails.
The charge volt age should be set at 2,23 V +/-1% x number of cells measured at the battery's terminals. To reduce the recharging time a charging stage can be applied in which the charging voltage is 2,35 to 2,4 V x number of cells (stand-by parallel operation with recharging stage).
Automatic changeover to the charging voltage of 2,23 V+/- 1% x number of cells follows after few hours on the voltage 2,35-2,4 V x number of cells. With the floating operation the direct current source is not able to supply the maximum load current at all times.
The load current intermit tently supersedes the nominal current of the direct current source. During this period the battery supplies power. It is not fully charged at all times. Therefore, depending on the load the charge voltage must be set at 2.23 to 2.30 V x number of cells.

b) Switch mode operation
When charging the battery is separated from the load. Towards the end of the charging process the charge voltage of the battery is 2,6 - 2,75 V/cell. The charging process and parameters must be monitored (see Sections 2.4, 2.5 and 2.6). On reaching a fully charged state the charging process must be stopped or switched to float charge as under Section 2.3.

c) Battery operation (charge/discharge operation)
Only the battery supplies the load. Hereby the charge voltage of the battery towards the end of the charging process is 2,6-2,75 V/cell. The charging process and parameters must be monitored (see Sections 2.4, 2.5 and 2.6). When reaching a fully charged state the charging process must be switched off. The battery can be switched to the load as necessary.

2.3 Maintaining the full charge (float charging)

Devices complying with the stipulations under DIN 41773 (IU characteristic) must be used. They are to be set so that the average cell voltage is 2,23V +/- 1% (2,25 V +/- 1% for UPS) cell at 20°C and the electrolyte density does not decrease over a protracted period (otherwise see 2.8).

2.4 Equalizing charge

Equalizing charges are required after exhaustive discharges and after inadequate charges; they can be carried out as follows:
- Up to 72 hours at constant voltage of max. 2.4 V/ cell,
- With the I or W characteristic as under 2.6. If during equalizing charging permitted load voltages are exceeded, appropriate measures must be taken, e. g. disconnection of the load. If exceeding the maximum temperature of 55°C the charging must either be stopped, proceed with reduced current, or be switched to float charge to allow the temperature to drop. The equalizing charge is completed when the electrolyte densities no longer increases within a period of 2 hours.

2.5 Alternating currents with periodic deviations

On recharging up to 2,4 V/cell as under operation modes a) to c) the actual value of the alternating current is occasionally permitted to reach max. 20 A per 100 Ah nominal capacity. Above 2,4 V/cells 10 A per 100 Ah nominal capacity may not be exceeded. In a fully charged state with a charge voltage of 2,23 to 2,30 V/cell the actual value of the alternating current must not exceed 5 A per 100 Ah nominal capacity.

2.6 Charging currents

The charging currents are not limited up to 2,4 V/ cell. When exceeding the charging voltage of 2,4 V/cell, greater water decomposition occurs. The charging currents per 100 Ah nominal capacity shown in Table 1 must not be exceeded.

Charging procedure	Cell model	Cell voltage
I-charact.	5,0 A	2,6 - 2,75
W-charact.	7,0 A 3,5 A	at 2,4 V at 2,65 V

2.7 Temperature

The recommended operating temperature for Lead-acid batteries is 10°C to 30°C. The technical data apply for the nominal temperaure 20°C. The ideal operating temperature is 20 +/- 5°C. Higher temperatures shorten the service life. Lower temperatures reduce the available capacity. The maximum temperature of 55°C must not be exceeded.

2.8 Temperature-related charge voltage

A temperature-related adjustment of the charge voltage within the operating temperature of 15°C to 25°C is not necessary. Should the temperature range be lower than 15°C and/or higher than 25°C a temperature related adjustment of the charge voltage should be made. The temperature correction factor is (-0.004 V/Cell per °K).
Should the temperature constantly rise above 40°C then the factor is (-0.003 V/Celi per °K).

2.9 Electrolyte

The electrolyte is diluted sulphuric acid. The nominal electrolyte density is based on 20°C and the nominal electrolyte level when fully charged with maximum deviation +/ - 0.01 kg/l. Higher temperatures reduce the electrolyte density; lower temperatures increase the electrolyte density. The associated correction factor is 0.0007 kg/l per °K. Example: electrolyte density of 1.23 kg/l at 35°C corresponds to a density of 1.24 kg/l at 20°C or electrolyte density of 1.25 kg/l at 5°C corresponds to a density of 1.24 kg/l at 20°C.

3. Battery maintenance and control

The electrolyte level must be checked regularly. If it dropped to the lowest electrolyte level mark, purified water must be added as under DIN 43530 Part 4, maximum conductivity 30 µS/cm.
To avoid leakage currents keep the battery clean and dry (especially inter cell connections). Plastic battery components, in particular the vent caps, must only be cleaned with water that contains no additives.
At least every 6 months the following must be measured and recorded:
- Battery voltage
- Voltage of a few selected cells/mono block batteries
- Electrolyte density of a few selected cells/mono block batteries
- Electrolyte temperature of a few selected cells/mono block batteries

The following must be measured and recorded annually:
- Voltage of all cells/mono block batteries
- Electrolyte density of all cells/mono block batteries
- Electrolyte temperature of a few selected cells/mono block batteries
- Should the float charge voltage in one celi deviate more than + 0.1 V or - 0.05 V from the average value (see 2.3), equalizing charging should be done (see 2.4.). Annual visual checks:
- on bolted connectors (check that unsecured bolt connectors are firmly seated)
- on battery installation or arrangement
- on ventilation of battery room.

4. Tests

Tests must be performed on fully charged batteries according to EN 60896-1.
In addition, special test instructions such as EN 50272-2 must be observed.

5. Faults

Should faults be detected in the battery or the charging device, customer services should be called in immediately.
Measurement records under Section 3 are necessary for fast fault detection and removal.

6. Storage and taking out of operation

Should cells/batteries be stored or taken out of operation for a longer period of time, they must be stored fully charged in a dry, frost-free room with max. temperature of 25°C. Direct sunlight or other heat sources must be avoided. To avoid damage the following charging methods can be chosen:
a. Equalizing charges on a quarterly basis as under Section 2.4. In average, ambient temperatures of more than 30°C monthly equalizing charges may be necessary.
b. Float charging as under Section 2.3.above.

7. Transport

Batteries, wet, filled with acid require transport under demands of European Agreement concerning the international carriage of dangerous goods (ADR and RID). ADR special provision No. 598: New batteries are not subject to the requirements of ADR, when:
- they are secured in such a way that they can not slip, fall or be damaged;
- they are provided with carrying devices, unless they are suitably stacked, e.g. on pallets;
- there are no dangerous traces of alkalis or acids on the outside;
- they are protected against short circuits.

8. Technical data

The nominal voltage, the number of blocks, the nominal capacity (C10 = CN) and the battery type are obtained from the type plate.

8.1 Example

Date on type plate: 6 V 6 OPzS 300
Key:
- 6 V = Nominal voltage of the blocks battery (with individual cells the nominal voltage is 2 V)
- 6 = Number of positive plates
- OPzS = Type
- 300 = Nominal capacity C10 under EN 60896-1. Capacity with discharge period of 10 h (t10) to final discharge voltage 1,80 V/cell.

Other capacities at different discharge currents with the corresponding discharge times and final discharge voltage can be found in technical data list for TAB OPzS stationary batteries.

Pb

Spent batteries must be collected separately and recycled.

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