



U.S. Department
of Transportation

1200 New Jersey Avenue, SE
Washington, DC 20590

**Pipeline and Hazardous
Materials Safety
Administration**

August 14, 2020

Timothy W Wiseman
Scopelitis, Garvin, Light, Hanson & Feary, P.C.
10 West Market Street, Suite 1400
Indianapolis, IN 46204

Reference No. 20-0021

Dear Mr. Wiseman:

This letter is in response to your March 4, 2020, email and subsequent phone conversations with a member of my staff requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to the shipment of UN 2794, Batteries, wet, filled with acid, electric storage, 8. In your letter, you describe a scenario where (1) the battery “cells” have independent enclosures and terminals that are connected to other “cells” with cable leads, (2) no individual “cell” exceeds the 882-pound net mass or 119-gallon volumetric capacity threshold, and (3) the “cells” are contained within an intermediate steel containment. Specifically, you ask whether the mass and volumetric capacities of batteries should be assessed on an individual “cell” basis or as a combined unit when determining whether a packaging meets the definition of a “bulk” or “non-bulk” packaging in § 171.8.

Based on the information you provided in your scenario, the mass and capacity of the wet battery “cells” you described are not considered individual batteries when the battery “cells” are connected with cable leads and function as a single battery. Determining whether the packaging meets the definition of a bulk or non-bulk packaging will depend on the size and weight of the assembled battery.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

A handwritten signature in blue ink that reads "T. Glenn Foster".

T. Glenn Foster
Chief, Regulatory Review and Reinvention
Standards and Rulemaking Division

Walcott
20-0021

Dodd, Alice (PHMSA)

From: INFOCNTR (PHMSA)
Sent: Wednesday, March 4, 2020 2:44 PM
To: Hazmat Interps
Subject: FW: PHMSA - Request for Interpretation
Attachments: PHMSA Interp. Rqst - Non-Bulk Batteries v2.pdf; Wiseman_LOI_3-4-20.docx

Hello Alice and Ikeya,

Please see attached for letter of interpretation request.

Thank you,
Kathryn (HMIC)

From: Wiseman, Brandon [mailto:bwiseman@scopelitis.com]
Sent: Wednesday, March 4, 2020 12:32 PM
To: INFOCNTR (PHMSA) <INFOCNTR.INFOCNTR@dot.gov>
Cc: twiseman scopelitis.com <twiseman@scopelitis.com>
Subject: PHMSA - Request for Interpretation

Sir/Madam:

Please see the attached request for official interpretation regarding shipments of lead acid batteries. If you have any questions, please contact us. Thank you.

Brandon K. Wiseman, Partner
Scopelitis, Garvin, Light, Hanson & Feary, P.C.
10 West Market Street, Suite 1400, Indianapolis, IN 46204
bwiseman@scopelitis.com | T: 317.637.1777 | D: 317.492.9296

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TIMOTHY W. WISEMAN
twiseman@scopelitis.com

March 4, 2020

Via Email (infocntr@dot.gov)

U.S. Department of Transportation
PHMSA Standards and Rulemaking Division
Attn: PHH-10
East Building
1200 New Jersey Avenue, SE
Washington, DC 20590-0001

Re: Request for Interpretation – Battery Shipments

Dear Sir/Madam:

This question concerns shipments of palletized UN 2794 lead acid batteries and the non-bulk packaging provisions contained in 49 C.F.R. § 173.159. Prior PHMSA interpretation number 16-0081 indicates that electric storage batteries firmly secured to pallets meet the definition of a “package” pursuant to § 173.159(d)(1) and that if such package meets the definition of “bulk packaging” under § 171.8 (i.e., has a maximum net mass greater than 400 kg (882 lbs.) and a maximum capacity greater than 450 L (119 gals) with no intermediate forms of containment), then the exterior of the transport vehicle must be marked with the UN identification number as required by § 172.331. A subsequent PHMSA interpretation (Ref. No. 17-0050) clarifies that to constitute “bulk packaging,” palletized electric batteries must exceed *both* the 882-pound net mass and 119-volumetric capacity thresholds. Otherwise, the packages are considered non-bulk and the transport vehicles need not be marked with the UN number.

In this case, our client transports industrial lead acid batteries, which consist of several independent battery “cells” connected together on individual terminals with cable leads and housed within a steel enclosure. These batteries come in various configurations and sizes, as depicted in the attached manufacturer specification sheet (*Exhibit A*). The proper shipping name for these batteries is UN 2794, Batteries, wet, filled with acid, electric storage.

Indianapolis • Chicago • Washington, D.C. • Los Angeles • Chattanooga • Detroit
Dallas/Fort Worth • Milwaukee • Philadelphia/Mt. Ephraim • Salt Lake City • Seattle

As shown in the enclosed photographs (*Exhibit B*), the batteries are firmly secured to pallets for highway transport and are otherwise prepared and packaged in accordance with 49 C.F.R. §§ 173.159(a) and (d)(1). Depending on the particular configuration, the net mass of a single steel enclosure and its battery “cell” contents may exceed 882 pounds, and the enclosure itself may have a volumetric capacity that exceeds 119 gallons. However, in no event would the independent batteries within a steel enclosure exceed either of those two thresholds.

Recognizing PHMSA’s earlier guidance that “the size of the battery determines whether a package meeting the requirements of § 173.159(d)(1) is considered bulk or non-bulk” (Ref. No. 16-0081), our question is whether the mass and volume capacities of the batteries described above should be assessed on an individual “cell” basis or as a combined unit. It is our opinion that because (1) the cells are essentially independent batteries (i.e., with independent enclosures and terminals) that are connected to other cells with cable leads; (2) no individual cell exceeds the 882-pound net mass or 119-gallon volumetric capacity threshold; and (3) the cells are contained within an intermediate steel containment, they are properly considered non-bulk packages and the transport vehicles need not display the UN number. However, we respectfully request PHMSA’s confirmation of the same.

We appreciate your attention to this matter. If you require any additional information, please contact me.

Sincerely,

Timothy W. Wiseman

Enclosures

EXHIBIT A

TRIATHLON[®]

INTELLIGENT BATTERIES

▶ **Lead-Acid batteries**



► TRIATHLON® – The Company



As an assembly manufacturer and developer of Lead-Acid batteries and Lithium-Ion battery systems, TRIATHLON® produces batteries for a wide range of industrial motive power applications including electric forklifts and pallet trucks, mobile lifting platforms and cleaning machines.

Decades of experience and technical expertise, combined with state-of-the-art production facilities ensure the highest quality of motive power batteries available. The site is certified according to DIN EN ISO 9001:2015, DIN EN ISO 14001:2015 and BS OHSAS 18001:2007.

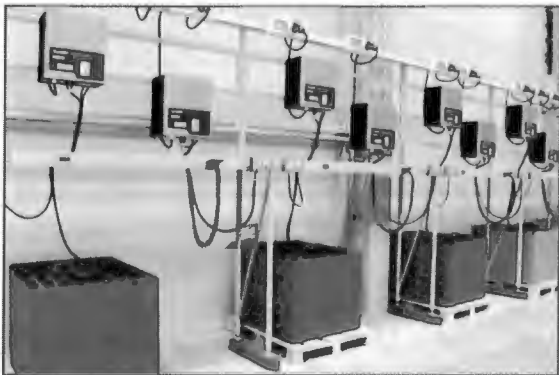
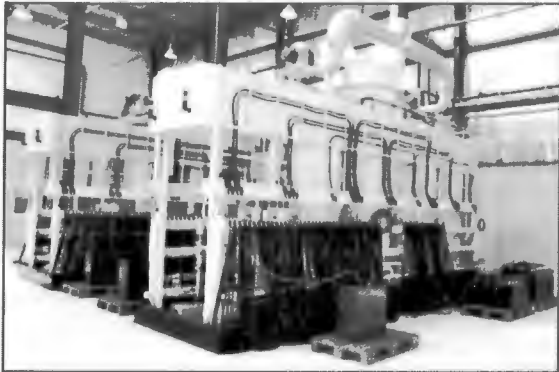
A solid network of sales and service partners in Germany, Europe and the United States provide competent solution based advice and both flexible and reliable onsite service.

 **Reliable**

 **Flexible**

 **Powerful**

 **Competent**



TRIATHLON® Lead-Acid batteries utilize the highly sophisticated European tubular plate technology with flexible bolt-on inter-cell cable connectors. TRIATHLON® tubular batteries are designed specifically for all motive power heavy duty applications and multi-shift operations. For light to medium applications, we provide maintenance-free (valve regulated) gel technology batteries that stand out for their excellent cycle life and ease of use.

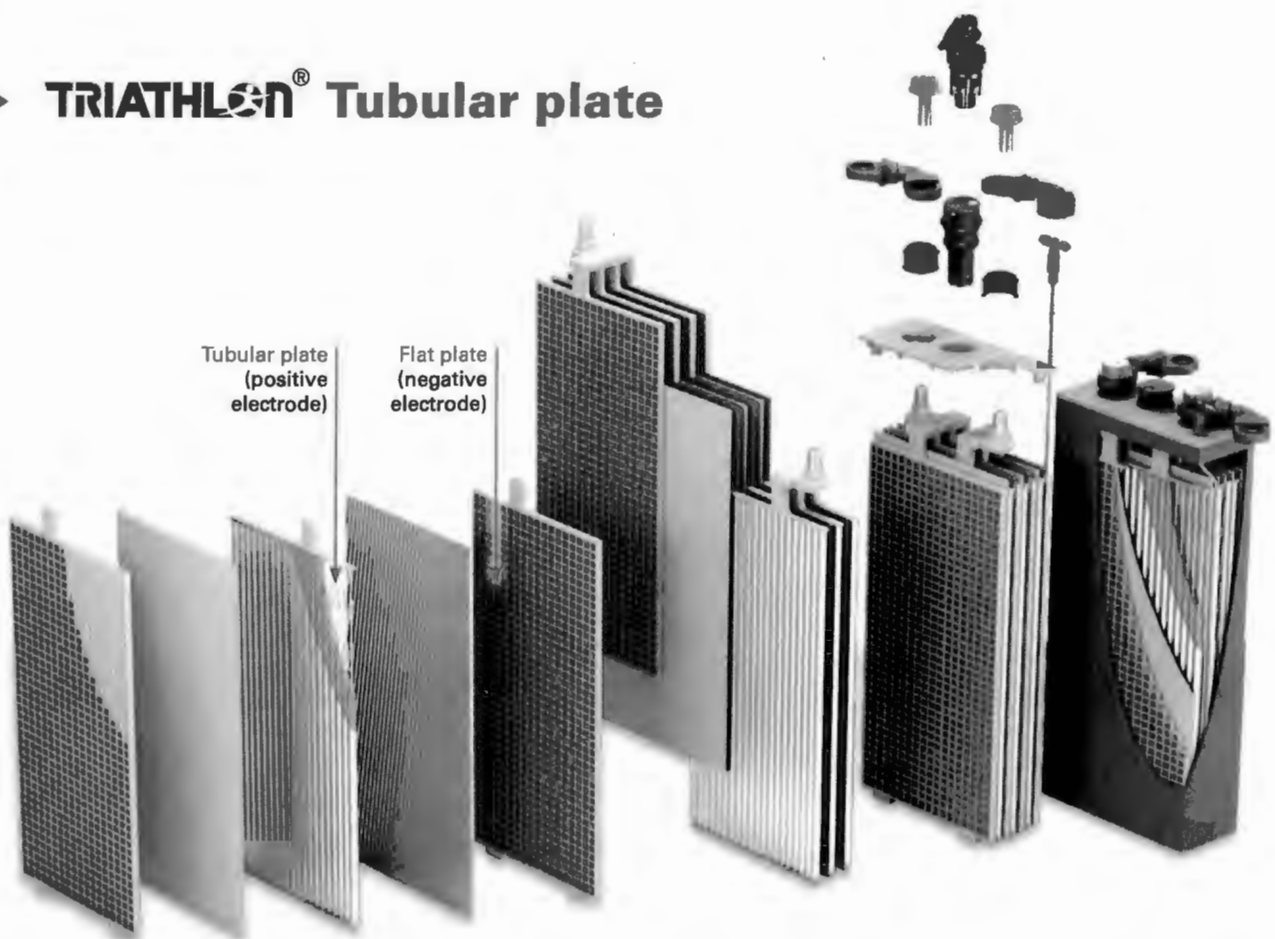
TRIATHLON® batteries and cells are built according to International Electrotechnical Commission Standards (IEC 60254-2).

TRIATHLON® batteries of the T-US, TPzS, TPzB and TPzV product lines ensure safe and reliable power for electric lift trucks. We are constantly and consistently working on new innovative power solutions for safe, cost-efficient, productivity enhancing and reliable motive power battery solutions.

With our T-US/TPzS AQUAsave battery lines, you can increase your productivity and lower your operating expenses through reduced watering intervals.

The TPzS Longlife line is designed to deliver longer service life that is realized by more charge/discharge cycles.

▶ TRIATHLON® Tubular plate



TRIATHLON® tubular positive plate cells are manufactured with a number of adjacent lead spines all connected across the top. A tubular gauntlet, made of acid-resistant and current-permeable polyester material, is slid over the tubular spines like fingers of a glove. The tubes are filled with lead dioxide (active material). The tubular plate is sealed with a plastic boot at the bottom. The advantage over flat plate batteries is that the tubular design provides greater surface area of active material when compared to standard flat plate batteries.

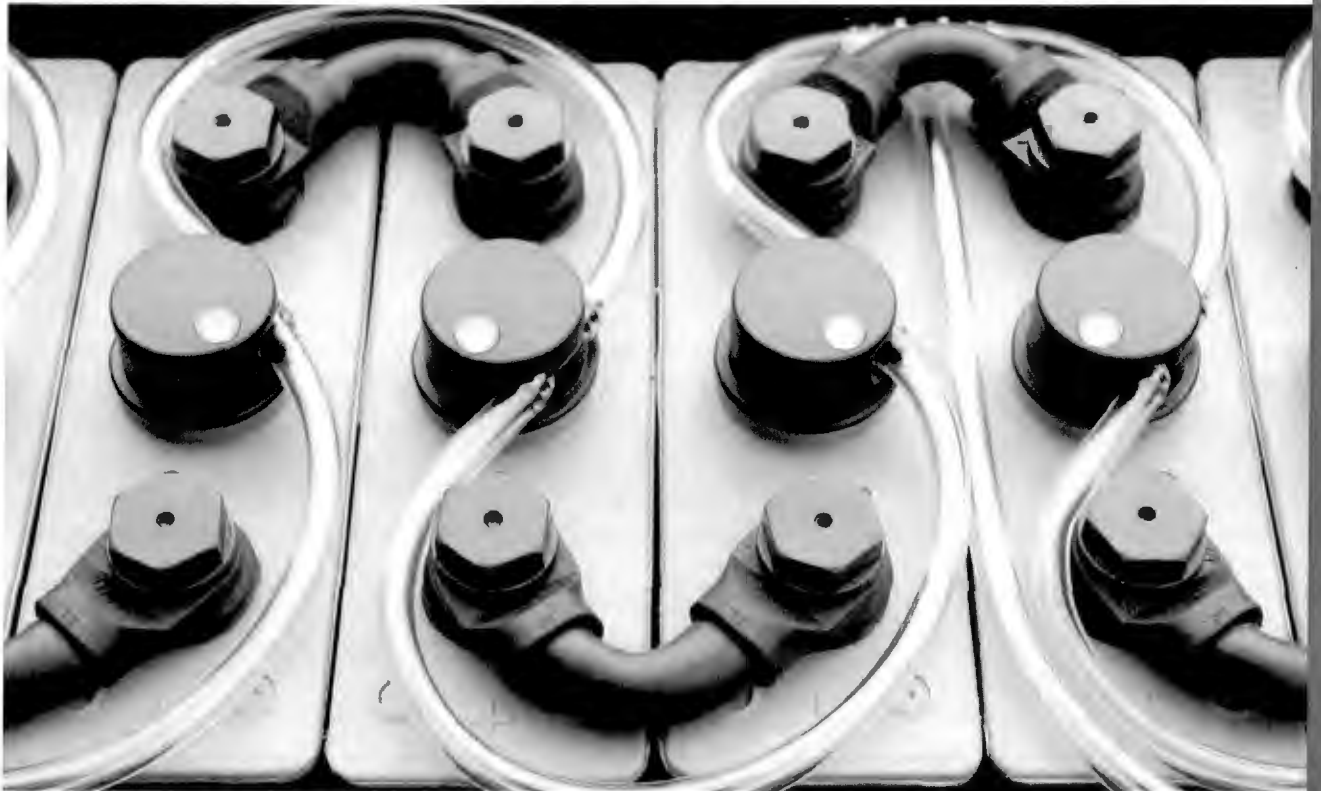
The result is a higher usable capacity battery than that of a standard flat plate battery. This translates directly into greater productivity due to longer runtimes.

The number of tubes, the length and the diameter varies depending on the type of battery. Battery cell dimensions are based on the size of the tubular positive plate and the corresponding negative flat plate. A complete battery cell consists of positive and negative plates (electrodes), separators and electrolyte.

PRODUCT FEATURES / ADVANTAGES:

- ▶ Higher Amp-Hour capacity and performance
- ▶ Increased cycle life
- ▶ Robust construction and durability

TRIATHLON® Flex connector



The electrical inter-cell connection between the battery's individual cells consists of a fully insulated, highly flexible copper-cable inter-cell connector. The flex connector is designed to deliver higher current with less internal resistance.

The maintenance-free flex connectors are designed to ensure full electric contact with the respective positive and negative terminals through the use of fully insulated bolts that have been treated with an industrial thread-locking adhesive. The fully insulated cable design protects the flex connector from corrosion due to exposure to electrolyte and it protects from accidental shorts which lead to disasters

PRODUCT FEATURES / ADVANTAGES:

- ▶ Optimal current transfer from cell to cell with no voltage drop
- ▶ Improved high current carrying capability
- ▶ Fully insulated cable connection (no additional inter-cell cover needed)
- ▶ High flexibility
- ▶ Corrosion resistant
- ▶ Less internal resistance resulting in lower operating temperatures

resulting from careless laying of metal objects or tools on top of uncovered connectors. The flex connector also reduces temperature related expansion and excessive vibration during use on rough floors or in harsh operating conditions.

Throughout the life of the battery, the flex connector will not tweak or place pressure on the cell's positive and negative bushings or posts. This eliminates any possible internal cell damage. The flex connector technology with bolt-on inter-cell connectors also ensures full and secure electrical contact with all conductive parts on top of the battery.

Be In Style flexible

TRIATHLON® TA-US AQUAsave

PRODUCT FEATURES

- ▶ Robust tubular flooded Lead-Acid technology
- ▶ Low-maintenance Lead-Acid technology with low antimony content in the lead alloy and greater head space due to tubular design
- ▶ Considerably reduced watering intervals (30-90 days) with optimized charge profile
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Increased cycle life
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 180 to 2000 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data – Cells

Width 6.20 in, US cell

90 Ah plate			100 Ah plate			125 Ah plate		
Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in
T90-5 AQ	180	2.00	T100-5 AQ	200	2.00	T125-5 AQ	250	2.00
T90-7 AQ	270	2.75	T100-7 AQ	300	2.75	T125-7 AQ	375	2.75
T90-9 AQ	360	3.50	T100-9 AQ	400	3.50	T125-9 AQ	500	3.50
T90-11 AQ	450	4.25	T100-11 AQ	500	4.25	T125-11 AQ	625	4.25
T90-13 AQ	540	5.00	T100-13 AQ	600	5.00	T125-13 AQ	750	5.00
T90-15 AQ	630	5.75	T100-15 AQ	700	5.75	T125-15 AQ	875	5.75
T90-17 AQ	720	6.50	T100-17 AQ	800	6.50	T125-17 AQ	1000	6.50
T90-19 AQ	810	7.25	T100-19 AQ	900	7.25	T125-19 AQ	1125	7.25
T90-21 AQ	900	8.00	T100-21 AQ	1000	8.00	T125-21 AQ	1250	8.00
T90-23 AQ	990	8.75	T100-23 AQ	1100	8.75	T125-23 AQ	1375	8.75
T90-25 AQ	1080	9.50	T100-25 AQ	1200	9.50	T125-25 AQ	1500	9.50
T90-27 AQ	1170	10.25	T100-27 AQ	1300	10.25	T125-27 AQ	1625	10.25
T90-29 AQ	1260	11.00	T100-29 AQ	1400	11.00	T125-29 AQ	1750	11.00
T90-31 AQ	1350	11.75	T100-31 AQ	1500	11.75	T125-31 AQ	1875	11.75
T90-33 AQ	1440	12.50	T100-33 AQ	1800	12.50	T125-33 AQ	2000	12.50

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



TRIATHLON[®] TE-US Enhanced Capacity



PRODUCT FEATURES

- ▶ Robust tubular flooded Lead-Acid technology
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Increased cycle life
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 180 to 2000 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data – Cells

Width 6.20 in, US cell

100 Ah plate			140 Ah plate		
Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in
T100-5 EC	200	2.00	T140-5 EC	280	2.00
T100-7 EC	300	2.75	T140-7 EC	420	2.75
T100-9 EC	400	3.50	T140-9 EC	560	3.50
T100-11 EC	500	4.25	T140-11 EC	700	4.25
T100-13 EC	600	5.00	T140-13 EC	840	5.00
T100-15 EC	700	5.75	T140-15 EC	980	5.75
T100-17 EC	800	6.50	T140-17 EC	1120	6.50
T100-19 EC	900	7.25	T140-19 EC	1260	7.25
T100-21 EC	1000	8.00	T140-21 EC	1400	8.00
T100-23 EC	1100	8.75	T140-23 EC	1540	8.75
T100-25 EC	1200	9.50	T140-25 EC	1680	9.50
T100-27 EC	1300	10.25	T140-27 EC	1820	10.25
T100-29 EC	1400	11.00	T140-29 EC	1960	11.00
T100-31 EC	1500	11.75	T140-31 EC	2100	11.75
T100-33 EC	1600	12.50	T140-33 EC	2240	12.50

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



Lead-Acid batteries

TRIATHLON® TPzS

PRODUCT FEATURES

- ▶ Robust tubular flooded Lead-Acid technology
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Increased cycle life
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 100 to 1550 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data – Cells

Width 7.80 in, DIN cell

60 Ah plate				60 Ah plate				80 Ah plate				90 Ah plate				105 Ah plate								
H1 = 10.24 H2 = 11.42				H1 = 13.11 H2 = 14.29				H1 = 15.59 H2 = 16.77				H1 = 18.23 H2 = 19.41				H1 = 20.12 H2 = 21.30								
Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in					
2	TPzS	100	100	1.85	2	TPzS	120	120	1.85	2	TPzS	160	160	1.85	2	TPzS	180	180	1.85	2	TPzS	210	210	1.85
3	TPzS	150	150	2.56	3	TPzS	180	180	2.56	3	TPzS	240	240	2.56	3	TPzS	270	270	2.56	3	TPzS	315	315	2.56
4	TPzS	200	200	3.27	4	TPzS	240	240	3.27	4	TPzS	320	320	3.27	4	TPzS	360	360	3.27	4	TPzS	420	420	3.27
5	TPzS	250	250	3.98	5	TPzS	300	300	3.98	5	TPzS	400	400	3.98	5	TPzS	450	450	3.98	5	TPzS	525	525	3.98
6	TPzS	300	300	4.69	6	TPzS	360	360	4.69	6	TPzS	480	480	4.69	6	TPzS	540	540	4.69	8	TPzS	630	630	4.69
7	TPzS	350	350	5.39	7	TPzS	420	420	5.39	7	TPzS	560	560	5.39	7	TPzS	630	630	5.39	7	TPzS	735	735	5.39
8	TPzS	400	400	6.10	8	TPzS	480	480	6.10	8	TPzS	640	640	6.10	8	TPzS	720	720	6.10	8	TPzS	840	840	6.10
9	TPzS	450	450	6.81	9	TPzS	540	540	6.81	9	TPzS	720	720	6.81	9	TPzS	810	810	6.81	9	TPzS	945	945	6.81
10	TPzS	600	600	7.52	10	TPzS	800	800	7.52	10	TPzS	900	900	7.52	10	TPzS	900	900	7.52	10	TPzS	1050	1050	7.52

115 Ah plate				125 Ah plate				140 Ah plate				155 Ah plate							
H1 = 21.34 H2 = 22.52				H1 = 22.56 H2 = 23.74				H1 = 26.89 H2 = 28.07				H1 = 28.07 H2 = 29.25							
Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in	Type	Ah	C ₂₀	L in				
2	TPzS	230	230	1.85	2	TPzS	250	250	1.85	2	TPzS	280	280	1.85	2	TPzS	310	310	1.85
3	TPzS	345	345	2.56	3	TPzS	375	375	2.56	3	TPzS	420	420	2.56	3	TPzS	465	465	2.56
4	TPzS	460	460	3.27	4	TPzS	500	500	3.27	4	TPzS	560	560	3.27	4	TPzS	620	620	3.27
5	TPzS	575	575	3.98	5	TPzS	625	625	3.98	5	TPzS	700	700	3.98	5	TPzS	775	775	3.98
6	TPzS	690	690	4.69	6	TPzS	750	750	4.69	6	TPzS	840	840	4.69	6	TPzS	930	930	4.69
7	TPzS	805	805	5.39	7	TPzS	875	875	5.39	7	TPzS	980	980	5.39	7	TPzS	1085	1085	5.39
8	TPzS	920	920	6.10	8	TPzS	1000	1000	6.10	8	TPzS	1120	1120	6.10	8	TPzS	1240	1240	6.10
9	TPzS	1035	1035	6.81	9	TPzS	1125	1125	6.81	9	TPzS	1260	1260	6.81	9	TPzS	1395	1395	6.81
10	TPzS	1150	1150	7.52	10	TPzS	1250	1250	7.52	10	TPzS	1400	1400	7.52	10	TPzS	1550	1550	7.52

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



TRIATHLON® TPzS A(X) AQUAsave



PRODUCT FEATURES

- ▶ Robust tubular flooded Lead-Acid technology
- ▶ Low-maintenance Lead-Acid technology with low antimony content in the lead alloy and greater head space due to tubular design
- ▶ Considerably reduced watering intervals with optimized charge profile
Version A: 30 to 60 days
Version AX: 60 to 90 days
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Increased cycle life
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 120 to 1550 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data - Cells

Width 7.80 in, DIN cell

60 Ah plate			80 Ah plate			90 Ah plate			105 Ah plate			115 Ah plate		
Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in
2 TPzS 120 A	120	1.85	2 TPzS 160 A	160	1.85	2 TPzS 180 A	180	1.85	2 TPzS 210 A	210	1.85	2 TPzS 230 AX	230	1.85
3 TPzS 180 A	180	2.56	3 TPzS 240 A	240	2.56	3 TPzS 270 A	270	2.56	3 TPzS 315 A	315	2.56	3 TPzS 345 AX	345	2.56
4 TPzS 240 A	240	3.27	4 TPzS 320 A	320	3.27	4 TPzS 360 A	360	3.27	4 TPzS 420 A	420	3.27	4 TPzS 460 AX	460	3.27
5 TPzS 300 A	300	3.98	5 TPzS 400 A	400	3.98	5 TPzS 450 A	450	3.98	5 TPzS 525 A	525	3.98	5 TPzS 575 AX	575	3.98
6 TPzS 360 A	360	4.69	6 TPzS 480 A	480	4.69	6 TPzS 540 A	540	4.69	6 TPzS 630 A	630	4.69	6 TPzS 690 AX	690	4.69
7 TPzS 420 A	420	5.39	7 TPzS 560 A	560	5.39	7 TPzS 630 A	630	5.39	7 TPzS 735 A	735	5.39	7 TPzS 805 AX	805	5.39
8 TPzS 480 A	480	6.10	8 TPzS 640 A	640	6.10	8 TPzS 720 A	720	6.10	8 TPzS 840 A	840	6.10	8 TPzS 920 AX	920	6.10
9 TPzS 540 A	540	6.81	9 TPzS 720 A	720	6.81	9 TPzS 810 A	810	6.81	9 TPzS 945 A	945	6.81	9 TPzS 1035 AX	1035	6.81
10 TPzS 600 A	600	7.52	10 TPzS 800 A	800	7.52	10 TPzS 900 A	900	7.52	10 TPzS 1050 A	1050	7.52	10 TPzS 1150 AX	1150	7.52

115 Ah plate			125 Ah plate			140 Ah plate			155 Ah plate			140 Ah plate		
Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in
2 TPzS 230 A	230	1.85	2 TPzS 250 A	250	1.85	2 TPzS 280 A	280	1.85	2 TPzS 310 A	310	1.85	2 TPzS 280 AX	280	1.85
3 TPzS 345 A	345	2.56	3 TPzS 375 A	375	2.56	3 TPzS 420 A	420	2.56	3 TPzS 465 A	465	2.56	3 TPzS 420 AX	420	2.56
4 TPzS 460 A	460	3.27	4 TPzS 500 A	500	3.27	4 TPzS 560 A	560	3.27	4 TPzS 620 A	620	3.27	4 TPzS 580 AX	580	3.27
5 TPzS 575 A	575	3.98	5 TPzS 625 A	625	3.98	5 TPzS 700 A	700	3.98	5 TPzS 775 A	775	3.98	5 TPzS 700 AX	700	3.98
6 TPzS 690 A	690	4.69	6 TPzS 750 A	750	4.69	6 TPzS 840 A	840	4.69	6 TPzS 930 A	930	4.69	6 TPzS 840 AX	840	4.69
7 TPzS 805 A	805	5.39	7 TPzS 875 A	875	5.39	7 TPzS 980 A	980	5.39	7 TPzS 1085 A	1085	5.39	7 TPzS 980 AX	980	5.39
8 TPzS 920 A	920	6.10	8 TPzS 1000 A	1000	6.10	8 TPzS 1120 A	1120	6.10	8 TPzS 1240 A	1240	6.10	8 TPzS 1120 AX	1120	6.10
9 TPzS 1035 A	1035	6.81	9 TPzS 1125 A	1125	6.81	9 TPzS 1280 A	1280	6.81	9 TPzS 1395 A	1395	6.81	9 TPzS 1260 AX	1260	6.81
10 TPzS 1150 A	1150	7.52	10 TPzS 1250 A	1250	7.52	10 TPzS 1400 A	1400	7.52	10 TPzS 1550 A	1550	7.52	10 TPzS 1400 AX	1400	7.52

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



TRIATHLON® TPzS LL Longlife

PRODUCT FEATURES

- ▶ Longer service life giving more charge/discharge cycles
- ▶ Increased active material with reduced acid density
- ▶ Robust tubular flooded Lead-Acid technology
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 110 to 1450 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data – Cells

Width 7.80 in, DIN cell

55 Ah plate			75 Ah plate			85 Ah plate		
Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in
2 TPzS 110 LL	110	1.85	2 TPzS 150 LL	150	1.85	2 TPzS 170 LL	170	1.85
3 TPzS 165 LL	165	2.56	3 TPzS 225 LL	225	2.56	3 TPzS 255 LL	255	2.56
4 TPzS 220 LL	220	3.27	4 TPzS 300 LL	300	3.27	4 TPzS 340 LL	340	3.27
5 TPzS 275 LL	275	3.98	5 TPzS 375 LL	375	3.98	5 TPzS 425 LL	425	3.98
6 TPzS 330 LL	330	4.69	6 TPzS 450 LL	450	4.69	6 TPzS 510 LL	510	4.69
7 TPzS 385 LL	385	5.39	7 TPzS 525 LL	525	5.39	7 TPzS 595 LL	595	5.39
8 TPzS 440 LL	440	6.10	8 TPzS 600 LL	600	6.10	8 TPzS 680 LL	680	6.10
9 TPzS 495 LL	495	6.81	9 TPzS 675 LL	675	6.81	9 TPzS 765 LL	765	6.81
10 TPzS 550 LL	550	7.52	10 TPzS 750 LL	750	7.52	10 TPzS 850 LL	850	7.52

98 Ah plate			118 Ah plate			145 Ah plate		
Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in	Type	Ah C ₂₀	L in
2 TPzS 196 LL	196	1.85	2 TPzS 236 LL	236	1.85	2 TPzS 290 LL	290	1.85
3 TPzS 294 LL	294	2.56	3 TPzS 354 LL	354	2.56	3 TPzS 435 LL	435	2.56
4 TPzS 392 LL	392	3.27	4 TPzS 472 LL	472	3.27	4 TPzS 580 LL	580	3.27
5 TPzS 490 LL	490	3.98	5 TPzS 590 LL	590	3.98	5 TPzS 725 LL	725	3.98
6 TPzS 588 LL	588	4.69	6 TPzS 708 LL	708	4.69	6 TPzS 870 LL	870	4.69
7 TPzS 686 LL	686	5.39	7 TPzS 826 LL	826	5.39	7 TPzS 1015 LL	1015	5.39
8 TPzS 784 LL	784	6.10	8 TPzS 944 LL	944	6.10	8 TPzS 1180 LL	1180	6.10
9 TPzS 882 LL	882	6.81	9 TPzS 1026 LL	1026	6.81	9 TPzS 1305 LL	1305	6.81
10 TPzS 980 LL	980	7.52	10 TPzS 1180 LL	1180	7.52	10 TPzS 1450 LL	1450	7.52

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



TRIATHLON® TPzB



PRODUCT FEATURES

- ▶ Robust tubular flooded Lead-Acid technology
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Increased cycle life
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 64 to 1080 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data – Cells

Width 6.22 in, British Standard (BS) cell

32 Ah plate			H1 = 10.39 H2 = 11.57			42 Ah plate			H1 = 12.72 H2 = 13.90			55 Ah plate			H1 = 15.75 H2 = 16.93			65 Ah plate			H1 = 17.72 H2 = 18.90		
Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in			
2 TPzB	64	1.77	2 TPzB	84	1.77	2 TPzB	110	1.77	2 TPzB	130	1.77												
3 TPzB	96	2.40	3 TPzB	126	2.40	3 TPzB	165	2.40	3 TPzB	195	2.40												
4 TPzB	128	3.03	4 TPzB	168	3.03	4 TPzB	220	3.03	4 TPzB	260	3.03												
5 TPzB	160	3.66	5 TPzB	210	3.66	5 TPzB	275	3.66	5 TPzB	325	3.66												
6 TPzB	192	4.29	6 TPzB	252	4.29	6 TPzB	330	4.29	6 TPzB	390	4.29												
7 TPzB	224	4.92	7 TPzB	294	4.92	7 TPzB	385	4.92	7 TPzB	455	4.92												
8 TPzB	258	5.55	8 TPzB	336	5.55	8 TPzB	440	5.55	8 TPzB	520	5.55												
9 TPzB	288	6.18	9 TPzB	378	6.18	9 TPzB	495	6.18	9 TPzB	585	6.18												
10 TPzB	320	6.81	10 TPzB	420	6.81	10 TPzB	550	6.81	10 TPzB	650	6.81												

75 Ah plate			H1 = 20.04 H2 = 21.22			86 Ah plate			H1 = 22.32 H2 = 23.50			100 Ah plate			H1 = 23.78 H2 = 24.96			108 Ah plate			H1 = 26.69 H2 = 27.87		
Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in			
2 TPzB	150	1.77	2 TPzB	172	1.77	2 TPzB	200	1.77	2 TPzB	218	1.77												
3 TPzB	225	2.40	3 TPzB	258	2.40	3 TPzB	300	2.40	3 TPzB	324	2.40												
4 TPzB	300	3.03	4 TPzB	344	3.03	4 TPzB	400	3.03	4 TPzB	432	3.03												
5 TPzB	375	3.66	5 TPzB	430	3.66	5 TPzB	500	3.66	5 TPzB	540	3.66												
6 TPzB	450	4.29	6 TPzB	518	4.29	6 TPzB	600	4.29	6 TPzB	648	4.29												
7 TPzB	525	4.92	7 TPzB	602	4.92	7 TPzB	700	4.92	7 TPzB	756	4.92												
8 TPzB	600	5.55	8 TPzB	688	5.55	8 TPzB	800	5.55	8 TPzB	884	5.55												
9 TPzB	675	6.18	9 TPzB	774	6.18	9 TPzB	900	6.18	9 TPzB	972	6.18												
10 TPzB	750	6.81	10 TPzB	860	6.81	10 TPzB	1000	6.81	10 TPzB	1080	6.81												

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



TRIATHLON® TPzV

PRODUCT FEATURES

- ▶ Absolutely maintenance-free valve regulated Lead-Acid technology with gel electrolyte
- ▶ Very low self-discharge
- ▶ Tubular technology
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 110 to 1200 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data - Cells

Width 7.80 in, DIN cell

55 Ah plate			70 Ah plate			80 Ah plate					
			H1 = 13.39 H2 = 14.57			H1 = 15.75 H2 = 16.93			H1 = 18.11 H2 = 19.29		
Type	Ah	L	Type	Ah	L	Type	Ah	L			
	C ₂₀	in		C ₂₀	in		C ₂₀	in			
2 TPzV	110	1.85	2 TPzV	140	1.85	2 TPzV	160	1.85			
3 TPzV	165	2.56	3 TPzV	210	2.56	3 TPzV	240	2.56			
4 TPzV	220	3.27	4 TPzV	280	3.27	4 TPzV	320	3.27			
5 TPzV	275	3.98	5 TPzV	350	3.98	5 TPzV	400	3.98			
6 TPzV	330	4.69	6 TPzV	420	4.69	6 TPzV	480	4.69			
7 TPzV	385	5.39	7 TPzV	490	5.39	7 TPzV	560	5.39			
8 TPzV	440	6.10	8 TPzV	560	6.10	8 TPzV	640	6.10			
						10 TPzV	800	7.52			

100 Ah plate			120 Ah plate					
			H1 = 21.85 H2 = 23.03			H1 = 26.54 H2 = 27.72		
Type	Ah	L	Type	Ah	L			
	C ₂₀	in		C ₂₀	in			
2 TPzV	200	1.85	2 TPzV	240	1.85			
3 TPzV	300	2.56	3 TPzV	360	2.56			
4 TPzV	400	3.27	4 TPzV	480	3.27			
5 TPzV	500	3.98	5 TPzV	600	3.98			
6 TPzV	600	4.69	6 TPzV	720	4.69			
7 TPzV	700	5.39	7 TPzV	840	5.39			
8 TPzV	800	6.10	8 TPzV	960	6.10			
10 TPzV	1000	7.52	10 TPzV	1200	7.52			

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



TRIATHLON® TPzV-BS



PRODUCT FEATURES

- ▶ Absolutely maintenance-free valve regulated Lead-Acid technology with gel electrolyte
- ▶ Very low self-discharge
- ▶ Tubular technology
- ▶ The latest separator design delivers increased acid volumes and increases acid circulation
- ▶ Fully insulated flex connectors and post bolts
- ▶ Bolt-on termination cables can be easily replaced
- ▶ Standardized rated capacities range from 122 to 680 Ah
- ▶ Cell and battery properties comply with IEC 60254-2
- ▶ Recyclable



Technical data - Cells

Width 6.22 in, British Standard (BS) cell

61 Ah plate			H1 = 17.87 H2 = 19.06			71 Ah plate			H1 = 20.12 H2 = 21.30			85 Ah plate			H1 = 23.74 H2 = 24.92		
Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in	Type	Ah	L in
2 TPzV-BS	122	1.77	2 TPzV-BS	142	1.77	2 TPzV-BS	170	1.77	2 TPzV-BS	170	1.77	2 TPzV-BS	170	1.77	2 TPzV-BS	170	1.77
3 TPzV-BS	183	2.40	3 TPzV-BS	213	2.40	3 TPzV-BS	255	2.40	3 TPzV-BS	255	2.40	3 TPzV-BS	255	2.40	3 TPzV-BS	255	2.40
4 TPzV-BS	244	3.03	4 TPzV-BS	284	3.03	4 TPzV-BS	340	3.03	4 TPzV-BS	340	3.03	4 TPzV-BS	340	3.03	4 TPzV-BS	340	3.03
			5 TPzV-BS	355	3.66	5 TPzV-BS	425	3.66	5 TPzV-BS	425	3.66	5 TPzV-BS	425	3.66	5 TPzV-BS	425	3.66
			6 TPzV-BS	426	4.29	6 TPzV-BS	510	4.29	6 TPzV-BS	510	4.29	6 TPzV-BS	510	4.29	6 TPzV-BS	510	4.29
			7 TPzV-BS	497	4.92	7 TPzV-BS	595	4.92	7 TPzV-BS	595	4.92	7 TPzV-BS	595	4.92	7 TPzV-BS	595	4.92
			8 TPzV-BS	568	5.55	8 TPzV-BS	660	5.55	8 TPzV-BS	660	5.55	8 TPzV-BS	660	5.55	8 TPzV-BS	660	5.55

H1 = height to top of cover, H2 = total height
Height +/- 0.08 in

Recommended applications:



► TRIATHLON® Accessories



One of the most important components for motive power batteries with Lead-Acid technology is the electrolyte, a solution of sulfuric acid and water. When batteries are recharged, water is transformed into hydrogen and oxygen by electrolysis. In batteries with liquid electrolyte, this water consumption must be replaced at regular intervals with deionized water. The replacement water is extremely critical to prolonged battery life.

To ensure reliable battery operation, regular care and maintenance is required. To help with this, TRIATHLON® offers a full line of accessories for your battery and charging needs. Our goal is to help you optimally maintain and monitor your batteries and chargers in order to prevent needless failures and repairs.

Be more flexible

OPTIONS

AQUAmatic 4.0 watering system

► Reliable single point battery watering system.

AQUAcontrol level sensor

► Monitors and indicates the battery's electrolyte level.

icon Battery Guard 4.0 battery controller

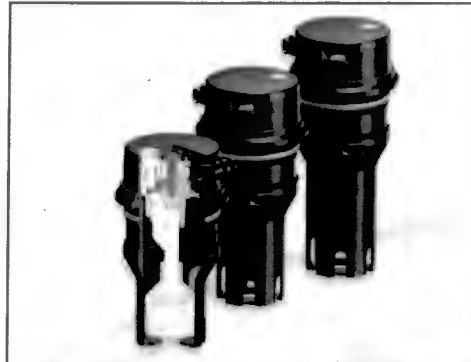
► Monitors, records and controls battery and charger conditions.

Air electrolyte circulation

► Air agitation mixes electrolyte during charge to prevent acid stratification. Reduces energy requirements and water consumption.

AQUAmobil watering cart

► Onsite portable filling of industrial batteries with deionized water.



Charger technology

► For optimal battery performance, it is recommended that TRIATHLON® motive power batteries be charged exclusively with TriCOM® series chargers.





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EXHIBIT B

