APC

APPLICATION NOTE #143

Electrolyte Quantities: Symmetra PX, Symmetra LX, and SmartUPS VT

By Stephen McCluer and Abigail Kasper

Abstract

This document specifies how much electrolyte is in the valve-regulated lead-acid (VRLA) modular battery units of SmartUPS VT, Symmetra LX, and Symmetra PX UPSs.

Introduction

Most local fire codes invoke special rules when the amount of electrolyte in a system exceeds a certain amount. One must determine what rules are enforced in any given jurisdiction. For example, in the USA:

- International Fire Code, Section 608
  Fire Code rules apply to lead acid battery systems having an electrolyte capacity of more than 50 gallons (189 Liters)
- Uniform Fire Code (NFPA 1), Chapter 52
  Fire Code rules apply to battery systems having an electrolyte capacity of more than 100 gal (378.5 L) in sprinklered buildings or 50 gal (189.3 L) in unsprinklered buildings
- City of Denver, CO
  Fire Code rules apply to battery systems having an electrolyte capacity of more than 10 gal (38 L)

The U.S. Environmental Protection Agency (EPA) requires filing of Tier 1 or Tier 2 hazardous material inventory reports on March 1 of every year. Users must report aggregate quantities of sulfuric acid (including the amounts contained in the electrolyte of lead-acid batteries) in excess of 500 pounds (226 kg). (See APC White Paper #32, Battery Technology for Data Centers and Network Rooms: Environmental Regulations)

Users must also keep Material Safety Data Sheets (MSDS) on all batteries stored and/or used in their facilities. MSDSs rarely (if ever) include information about the volume of electrolyte in any model number.

Notes:

- In the above examples, some jurisdictions may require reporting in volumes (gallons / liters), while others may require reporting in weight (pounds / kilograms).
- Most jurisdictions require reporting of the entire amount of electrolyte (which is acid plus water), but some want only the amount of acid.

APC by Schneider Electric manufactures the battery modules. The amount of electrolyte in a battery unit will vary depending upon the manufacturer of the battery component. Amounts listed in this application note are the most conservative (worst case) for reporting to authorities having jurisdiction (AHJ), as APC cannot guarantee what model of a battery component will ship in any particular battery unit or module.

Electrolyte values for Symmetra PX or SmartUPS VT systems

SYBTU1-PLP : All regions except Japan

The SYBTU1-PLP battery unit is used in both 208V and 400V Symmetra PX in all regions except Japan. It is also used in the SmartUPS VT UPS in North America. These component vendors are presently approved: BB Battery (BP7-12), CSB (GP1272F2), Panasonic (LC-R127R2P1), and Shenzhen Center Power Tech Co, LTD (CP1270).

Table 1 is based on the model with the most electrolyte.

Table 1: SYBTU1-PLP electrolyte values (all regions except Japan)**

Model	Single Unit	Single Module (4 Units)	40 kW (4 Modules)	80 kW / XR (8 Modules)
Electrolyte Volume	0.72 gal (2.78 L)	2.87 gal (11.14 L)	11.50 gal (44.54 L)	23.00 gal (89.09 L)
Electrolyte Weight	8.18 lb (3.72 kg)	32.73 lb (14.86 kg)	130.93 lb (59.44 kg)	261.86 lb (118.89 kg)
Sulfuric Acid Volume	0.23 gal (0.89 L)	0.91 gal (3.54 L)	3.66 gal (14.17 L)	7.31 gal (28.33 L)
Sulfuric Acid Weight	3.57 lb (1.62 kg)	14.27 lb (6.48 kg)	57.09 lb (25.92 kg)	114.17 lb (51.83 kg)

** Fully charged at normal operating temperature of 77ºF (25ºC)

Note 1: Panasonic LC-4127R2P1 and Vision CP1272 had been widely used but have been discontinued; they are still in use in some legacy sites.

Note 2: A small number of GS Portalac batteries were installed in NAM, but have been discontinued there and are now used only in Japan.

SYBTJU1-PLP: Japan

The SYBTJU1-PLP battery unit is used in all Symmetra PX and SmartUPS VT units sold in Japan. These vendors are presently approved: Panasonic (LC-P 127R2P1, UP-PW1236P1) and Japan Storage Battery (GS-PXL12072). **Table 2** is based on the model with the most electrolyte.

Table 2: SYBTJU1-PLP electrolyte values (Japan)*

Model	Single Unit	Single Module (4 Units)	40 kW (4 Modules)	80 kW / XR (8 Modules)
Electrolyte Volume	0.57 gal (2.59 L)	2.28 gal (10.37 L)	9.13 gal (41.47 L)	18.25 gal (82.94 L)
Electrolyte Weight	7.55 lb (3.42 kg)	30.21 lb (13.70 kg)	120.83 lb (54.78 kg)	241.66 lb (109.57 kg)
Sulfuric Acid Volume	0.18 gal (0.78 L)	.70 gal (3.14 L)	2.82 gal (23.04 L)	5.63 gal (25.09 L)
Sulfuric Acid Weight	3.18 lb (1.44 kg)	12.74 lb (5.76 kg)	50.94 lb (23.04 kg)	101.89 lb (46.08 kg)

* Fully charged at normal operating temperature of 77ºF (25ºC)

SYBTU2-PLP: Worldwide

The SYBTU2-PLP battery unit is used in 208V, 400V, and 480V Symmetra PX in all regions. These component vendors are presently approved: CSB (HRL 1234W F2FR), Enersys (NPX-L35/250FRTW), Japan Storage Battery/GS Battery (PXL12090), and Panasonic (UP-PW1245P1). **Tables 3a**, **3b**, and **3c** are based on the model with the most electrolyte.

Table 3a: SYBTU2-PLP Electrolyte values (50Hz regions)

Model PX48, PX 96/160	Single Unit	Single Module (4 Units)	4 Modules (16 Units)
Electrolyte Volume	0.61 gal (2.78 L)	2.45 gal (11.14 L)	9.79 gal (44.54 L)
Electrolyte Weight	7.98 lb (3.62 kg)	31.90 lb (14.46 kg)	127.62 lb (57.856 kg)
Sulfuric Acid Volume	0.17 gal (0.78 L)	0.67 gal (3.10 L)	2.67 gal (12.42 L)
Sulfuric Acid Weight	3.16 lb (1.43 kg)	12.6 lb (5.73 kg)	50.56 lb (22.91 kg)

Note 1: PX48 has 4 Units per module and a maximum of 4 modules.

Note 2: PX96/160 has 4 units per module and a maximum of 18 modules (9 per Extended Runtime (XR) Battery Enclosure). 2 XR Enclosures are required when power is >96kW.

Note 3: PX160 requires a minimum of 15 modules; 2 XR Enclosures can have up to 18 Modules.

Table 3b: **SYBTU2-PLP** Electrolyte values (60Hz regions)

Model PX100	Single Unit	Single Module (4 units)	9 Modules (36 Units)
Electrolyte Volume	0.61 gal (2.78 L)	2.45 gal (11.14 L)	22.03 gal (100.22L)
Electrolyte Weight	7.98 lb (3.62 kg)	31.90 lb (14.46 kg)	287.14 lb (130.18 kg)
Sulfuric Acid Volume	0.17 gal (0.78 L)	0.67 gal (3.10 L)	6.05 gal (27.94 L)
Sulfuric Acid Weight	3.16 lb (1.43 kg)	12.6 lb (5.73 kg)	113.76 lb (51.55 kg)

Table 3c: **SYBTU2-PLP** Electrolyte values (All regions)

Model PX250, PX 500	Single Unit	Single Module (6 Units)	16 Modules (96 Units)
Electrolyte Volume	0.61 gal (2.78 L)	3.67 gal (16.70 L)	58.75 gal (267.26 L)
Electrolyte Weight	7.98 lb (3.62 kg)	47.86 lb (21.70 kg)	765.70 lb (347.14 kg)
Sulfuric Acid Volume	0.17 gal (0.78 L)	1.01 gal (4.66 L)	16.13 gal (74.50 L)
Sulfuric Acid Weight	3.16 lb (1.43 kg)	18.96 lb (8.59 kg)	303.36 lb (137.47 kg)

Note 1: PX 250 has 6 units per module and a maximum of 16 modules (8 modules for each 125 kW).

Note 2: PX 500 has 6 units per module and a maximum of 32 modules (8 modules for each 125 kW).

Electrolyte values for Symmetra LX systems

SYBT5: Worldwide

The SYBT5 battery unit is used in 208/240V, 220/230/240V, and 380/400/415V Symmetra LX in all regions. These component vendors are presently approved: Panasonic (UP-RW1245P1), CSB (HR 1234W F2), B&B (HR1234W), and Kung Long (WP1234W). The following chart is based on the model with the most electrolyte.

Table 4: **SYBT5-PLP** Electrolyte values (All regions)

Model Symmetra LX	Single Unit	Single Module (1 Unit)	4 Modules (4 Units)
Electrolyte Volume	0.95 gal (3.60 L)	0.95 gal (3.60 L)	3.8 gal (14.4 L)

Note 1: Symmetra LX has 1 battery unit per module and a maximum of 4 modules(16kVA).

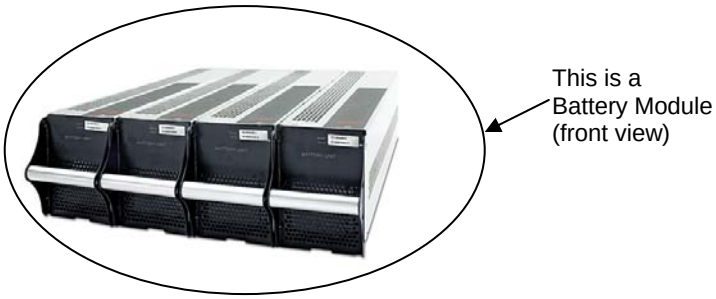
Conclusions

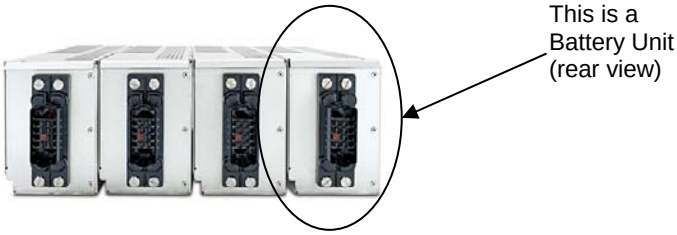
Find out the local regulations for batteries, then check the tables in this application note to see if the installed system(s) will exceed enforcement thresholds. Please note that U.S. codes permit the use of battery systems that exceed the threshold limits. The thresholds simply determine when a battery is large enough to be covered by the code, at which time certain requirements for room construction, ventilation, and control or reporting of hazardous materials must be met.

Appendix: Terminology

Battery Modules

Shown: four "battery **units**"= one "string" = one "**battery module"**
One or more battery modules, in conjunction with the charging equipment, comprise a "battery system."





About the Authors:

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