

# **APC by Schneider Electric**

## **Smart-UPS RT**

### **Guide Specifications**

**120 V/208 V/240 V, 1.5 kVA to 20 kVA models**

*THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTERFORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS IN THE PROJECT MANUAL AND WITH THE DRAWINGS.*

*WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", "INSTALL", "SUBMIT", ETC., UNLESS OTHERWISE INDICATED.*

## **SOLID STATE UNINTERRUPTIBLE POWER SUPPLY**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. **Scope:** This specification describes the operation and functionality of continuous duty, single-phase input and output power (1:1) and split-phase (two models), solid-state, static Uninterruptible Power Supply model, hereafter referred to as UPSs.
- B. **Included Features of the UPS:**
1. The UPS utilizes double conversion online topology designed to protect electronic equipment by supplying reliable, network-grade power featuring extremely tight voltage and frequency regulation.
  2. The UPS features internal bypass and input power factor correction.
  3. The primary sections of the UPS are: input disconnect and filter stage, input PFC power stage, energy storage stage (DC bus capacitor bank), output power stage (inverter), bypass and a battery charger. The control of power module and fault detection logic is microcontroller-based.
    - a. The input disconnect and filter stage contains an input back-feed relay (in models with an input wire plug), input filter, transient suppression, and battery select switches (mechanical relay or solid-state).
    - b. The input PFC power stage contains non-isolated power factor correcting AC/DC converters. This converter is capable of full power operation over a very wide input voltage range or from a nominal DC battery voltage.
    - c. The energy storage stage is a split DC bus capacitor handling seamless transitions from battery to line and vice versa, as well as the low and high frequency power stages ripple.
    - d. The output power (inverter) stage operates directly from the DC bus and produces a configurable AC output voltage of 120 V, 208 V, or 120 V/208 V output (depending on model) The output of the UPS is connected either to the inverter or through a bypass relay, contactor, or static switch to the filtered input line..
  4. The UPS contains a battery charger, which operates from the DC bus.
  5. The system also includes the following features.
    - a. Field-replaceable output power distribution panels (only available with some models)
    - b. A field-replaceable fan module (15 kVA and 20 kVA models)
    - c. Field-replaceable battery modules
    - d. Removable input/output wiring trays (15 kVA and 20 kVA models)
    - e. Battery disconnects
    - f. An LCD interface display (15 kVA to 20 kVA models)
    - g. Emergency Power Off (EPO)
    - h. An integrated UPS Network Management Card 2 with Environmental Monitoring (AP9631), pre-installed on models of 5 kVA and higher.
- C. **Performance, Design, and Configurations:** The UPS and associated equipment operates in conjunction with a primary power supply and an output distribution system to provide quality uninterrupted power for mission-critical, electronic equipment load.

1. This specification describes the performance, functionality, and design of the UPS, the external Battery Systems, and connectivity solutions.
2. All programming and miscellaneous components for a fully operational system as described in this section are available as part of the UPS.

3. The UPS is available in the following configurations:

<b>TYPE</b>	<b>MODEL</b>	<b>SKU</b>
<b>Tower</b>	APC Smart-UPS RT 1.5 kVA 120V	SURTA1500XL
	APC Smart-UPS RT 2.2 kVA 120V	SURTA2200XL
	APC Smart-UPS RT 3 kVA 120 V	SURTA3000XL
	APC Smart-UPS RT 3 kVA 208 V	SURTD3000XLT
	APC Smart-UPS RT 3 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURTD3000XLT-1TF3
	APC Smart-UPS RT 5 kVA 208 V	SURTD5000XLT
	APC Smart-UPS RT (Rack/Tower) 5 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURTD5000XLT-1TF3
	APC Smart-UPS RT 6 kVA 208 V	SURT6000XLT
	APC Smart-UPS RT (Rack/Tower) 6 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURT6000XLT-1TF3
	APC Smart-UPS RT 8 kVA 208 V	SURT8000XLT
	APC Smart-UPS RT (Rack/Tower) 8 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURT8000XLT-1TF3
	APC Smart-UPS RT 10 kVA 208 V	SURT10000XLT
	APC Smart-UPS RT 10, kVA 208 V with 208 V to 120 V Step-Down Transformer	SURT10000XLT-1TF10K
	APC Smart-UPS RT 10 kVA 208 V with (2) 208 V to 120 V Step-Down Transformers	SURT10000XLT-2TF3

<b>TYPE</b>	<b>MODEL</b>	<b>SKU</b>
<b>Rack-Mount</b>	APC Smart-UPS RT 1.5 kVA RM 120 V	SURTA1500RMXL2U
	APC Smart-UPS RT 2.2 kVA RM 120 V	SURTA2200RMXL2U
	APC Smart-UPS RT 3 kVA RM 120 V	SURTA3000RMXL3U
	APC Smart-UPS RT 3 kVA RM 208 V	SURTD3000RMXL3U
	APC Smart-UPS RT 3 kVA Rack- Mount 208 V with 208 V to 120 V Step-Down Transformer	SURTD3KRMXL3U-TF5
	APC Smart-UPS RT 5 kVA RM 208 V	SURTD5000RMXL3U
	APC Smart-UPS RT 5 kVA RM 120/208 V	SURTD5000RMXLP3U
	APC Smart-UPS RT 6 kVA RM 208 V	SURT6000RMXL3U
	APC Smart-UPS RT 6 kVA RM 120/208 V	SURTD6000RMXLP3U
	APC Smart-UPS RT 6 kVA RM 208 V with 208 V to 120 V 2 U Step-Down Transformer	SURT6KRMXL3U-TF5
	APC Smart-UPS RT 8 kVA RM 208 V	SURT8000RMXL6U
	APC Smart-UPS RT 8 kVA RM 208 V with 208 V to 120 V 2 U Step-Down Transformer	SURT8KRMXL6U-TF5
	APC Smart-UPS RT 10 kVA RM 208 V	SURT10000RMXL6U
	APC Smart-UPS RT 10 kVA RM 208 V with (2) 208 V to 120 V 2 U Step-Down Transformers	SURT10KRMXL6U-TF5
	APC Smart-UPS RT 15 kVA RM 208/240 V	SURT15KRMXLT
	APC Smart-UPS RT 15 kVA RM 208 V with 208 V to 120 V 10 kVA Step-down Transformer	SURT15KRMXLT-1TF10K
	APC Smart-UPS RT 15 kVA RM 208 V with 208 V to 120 V 5 kVA Step-Down Transformer	SURT15KRMXLT-TF5
	APC Smart-UPS RT 20 kVA RM 208/240 V	SURT20KRMXLT
	APC Smart-UPS RT 20 kVA RM 208 V with 208 V to 120 V 10 kVA Step-Down Transformer	SURT20KRMXLT-1TF10K
	APC Smart-UPS RT 20 kVA RM 208 V with 208 V to 120 V 5 kVA Step-Down Transformer	SURT20KRMXLT-TF5
<b>Battery Pack</b>	APC Smart-UPS RT 192 V RM Battery Pack 2 Rows (for 15 kVA and 20 kVA models)	SURT192RMXLBP2
	APC Smart-UPS RT 192 V Battery Pack (for 3 kVA to 10 kVA models)	SURT192XLBP
	APC Smart-UPS RT 192 V RM Battery Pack (for 3 kVA to 10 kVA models)	SURT192RMXLBP3U
	APC Smart-UPS RT 48 V Battery Pack (for 1.5 kVA and 2.2 kVA models)	SURTA48XLBP
	APC Smart-UPS RT 48 V RM Battery Pack (for 1.5 kVA and 2.2 kVA models)	SURTA48RMXLBP2U
<b>Replacement Batteries</b>	Replacement Battery Cartridge (for 1500 and 2.2 kVA models)	RBC57
	Replacement Battery Cartridge (for models of 3 kVA and higher)	RBC44

## 1.2 REFERENCES

- A. **General:** The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications is the latest date as of the date of the Contract Documents, unless otherwise specified.
- B. **Institute of Electrical and Electronics Engineers, Inc. (IEEE):**
1. ANSI/IEEE 519, "Guide for Harmonic Control and Reactive Compensation of Static Power Converters" (copyrighted by IEEE, ANSI approved).
- C. **International Organization for Standardization (ISO):**
1. ISO 9001, "Quality Management Systems - Requirements."
  2. ISO 14001, "Environmental Management Systems - Requirements with Guidance for Use."

## 1.3 STANDARDS

### A. Regulatory Compliance:

All Smart-UPS On-line models	CSA, FCC Part 15 Class A, UL 1778
SURTA1500RMXL2U: APC Smart-UPS RT 1.5 kVA Rack Tower 120 V SURTA2200RMXL2U: APC Smart-UPS RT 2.2 kVA RM 120 V SURTD3000RMXL3U: APC Smart-UPS RT 3 kVA Rack Tower 208 V SURTA3000RMXL3U: APC Smart-UPS RT 3 kVA Rack Tower 120 V SURTD5000RMXL3U :APC Smart-UPS RT 50 kVA Rack Tower 208 V SURT6000RMXL3U: APC Smart-UPS RT 6 kVA Rack Tower 208 SURT8000RMXL6U: APC Smart-UPS RT 8 kVA Rack Tower 208 V SURT10000RMXL6U APC Smart-UPS RT 10 kVA Rack Tower 208 V SURT20KRMXL: APC Smart-UPS RT 20 kVA RM 208 V SURT15KRMXL: APC Smart-UPS RT 15 kVA RM 208 V SURTA48RMXLBP2U: APC Smart-UPS RT 48 V RM Battery Pack1 SURT192RMXLBP3U :APC Smart-UPS RT 192 V RM Battery Pack2 AP9626: APC Step-Down Transformer RM 2 U 208 V IN, 120 V OUT with 5-20 Receptacles	OSHPD <sup>1</sup> , Preapproval
<sup>1</sup> OSHPD is the California Office of Statewide Health Planning and Development.	

## 1.4 SYSTEM DESCRIPTION

- A. **Mechanical Design**
1. The UPS is contained in one or two rugged steel cabinets. Only the 15 kVA and 20 kVA models have two cabinets, one containing the power electronics and the other containing the batteries and single phase distribution outlets.
  2. The UPS and battery cabinets are configured for tower, stack and rack-mount configurations.
  3. The cabinet dimensions including terminations are listed below for tower, stack or rack-mount configurations. The side rack-mounting brackets increase the overall width to 19 in (482 mm).

4. The UPS's rugged steel cabinet has plastic front bezels, one (for 1.5 kVA to 6 kVA models) and two (for 8 kVA to 20 kVA models).
5. The cabinet weights and dimensions are:

<b>Cabinet</b>	<b>SKU</b>	<b>Weight kg (lb)</b>	<b>Height mm (in)</b>	<b>Width mm (in)</b>	<b>Depth mm (in)</b>
APC Smart-UPS RT 1.5 kVA Rack Tower 120 V	SURTA1500RML2U	27.5 (60.5)	85 (3.35)	432 (17.00)	559 (22.00)
APC Smart-UPS RT 1.5 kVA 120 V	SURTA1500XL	27.5 (60.5)	432 (17.00)	85 (3.35)	559 (22.00)
APC Smart-UPS RT 2,2 kVA RM 120 V	SURTA2200RML2U	27.5 (60.5)	85 (3.35)	432 (17.00)	559 (22.00)
APC Smart-UPS RT 2,2 kVA 120 V	SURTA2200XL	27.5 (60.5)	85 (3.35)	432 (17.00)	559 (22.00)
APC Smart-UPS RT 3 kVA Rack Tower 120 V	SURTA3000RML3U	54.6 (120.0)	130 (5.10)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 3 kVA 120 V	SURTA3000XL	54.6 (120.0)	432 (17.00)	130 (5.10)	660 (26.00)
APC Smart-UPS RT 3 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURTD3000XLT-1TF3	111.4 (245.0)	432 (17.00)	259 (10.20)	660 (26.00)
APC Smart-UPS RT 3 kVA Rack- Mount 208 V with 208 V to 120 V Step-Down Transformer	SURTD3KRMXL3U-TF5	100.5 (221.0)	218 (8.60)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 5 kVA RM 208 V to 208/120 V	SURTD5000RMXLP3U	58.1 (127.7)	130 (5.10)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 5 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURTD5000XLT-1TF3	54.6 (120.0)	432 (17.00)	259 (10.20)	660 (26.00)
APC Smart-UPS RT (Rack/Tower) 6 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURT6000XLT-1TF3	54.6 (120.0)	432 (17.00)	259 (10.20)	660 (26.00)
APC Smart-UPS RT 6 kVA RM 208 V with 208 V to 120 V 2 U Step- Down Transformer	SURT6KRMXL3U-TF5	100.5 (221.0)	218 (8.60)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 6 kVA RM 208 V to 208/120 V	SURTD6000RMXLP3U	58.1 (127.7)	130 (5.10)	432 (17.00)	660 (26.00)

<b>UPS Cabinet</b>	<b>SKU</b>	<b>Weight kg (lb)</b>	<b>Height mm (in)</b>	<b>Width mm (in)</b>	<b>Depth mm (in)</b>
APC Smart-UPS RT (Rack/Tower) 8 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURT8000XLT-1TF3	167.7 (369.0)	432 (17.00)	392 (15.45)	736 (28.98)
APC Smart-UPS RT 8 kVA RM 208 V with 208 V to 120 V 2 U Step-Down Transformer	SURT8KRMXL6U-TF5	156.8 (345.0)	352 (13.85)	432 (17.00)	736 (28.98)
APC Smart-UPS RT 10 kVA 208 V with 208 V to 120 V Step-Down Transformer	SURT10000XLT-1TF10K	211.4 (465.0)	432 (17.00)	438 (17.25)	736 (28.98)
APC Smart-UPS RT 10 kVA 208 V with (2) 208 V to 120 V Step-Down Transformers	SURT10000XLT-2TF3	224.6 (494.0)	432 (17.00)	522 (20.55)	736 (28.98)
APC Smart-UPS RT 10 kVA RM 208 V with (2) 208 V to 120 V 2 U Step-Down Transformers	SURT10KRMXL6U-TF5	156.8 (345.0)	352 (13.85)	432 (17.00)	736 (28.98)
APC Smart-UPS RT 15 kVA RM 208 V with 208 V to 120 V 10 kVA Step-Down Transformer	SURT15KRMXL-1TF10K	347.7 (765.0)	708 (27.88)	432 (17.00)	773 (30.43)
APC Smart-UPS RT 15 kVA RM 208 V with 208 V to 120 V 5 kVA Step-Down Transformer	SURT15KRMXL-TF5	290.9 (640.0)	622 (24.48)	432 (17.00)	773 (30.43)
APC Smart-UPS RT 20 kVA RM 208 V with 208 V to 120 V 10 kVA Step-Down Transformer	SURT20KRMXL-1TF10K	347.7 (765.0)	708 (27.88)	432 (17.00)	773 (30.43)
APC Smart-UPS RT 20 kVA RM 208 V with 208 V to 120 V 5 kVA Step-Down Transformer	SURT20KRMXL-TF5	290.9 (640.0)	622 (24.48)	432 (17.00)	773 (30.43)

<b>UPS Cabinet</b>	<b>SKU</b>	<b>Weight kg (lb)</b>	<b>Height mm (in)</b>	<b>Width mm (in)</b>	<b>Depth mm (in)</b>
APC Smart-UPS RT 3 kVA Rack Tower 208 V	SURTD3000RMXLT3U	54.6 (120.0)	130 (5.10)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 3 kVA 208 V	SURTD3000XLT	54.6 (120.0)	432 (17.00)	130 (5.10)	660 (26.00)
APC Smart-UPS RT 5 kVA Rack Tower 208 V	SURTD5000RMXLT3U	58.2 (128.0)	130 (5.10)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 5 kVA 208 V	SURTD5000XLT	54.6 (120.0)	432 (17.00)	130 (5.10)	660 (26.00)
APC Smart-UPS RT 6 kVA Rack/Tower 208 V	SURT6000RMXLT3U	54.6 (120.0)	130 (5.10)	432 (17.00)	660 (26.00)
APC Smart-UPS RT 6 kVA 208 V	SURT6000XLT	54.6 (120.0)	432 (17.00)	130 (5.10)	660 (26.00)
APC Smart-UPS RT 8 kVA Rack/Tower 208 V	SURT8000RMXLT6U	110.9 (244.0)	263 (10.35)	432 (17.00)	736 (28.98)
APC Smart-UPS RT 8 kVA 208 V	SURT8000XLT	110.9 (244.0)	432 (17.00)	263 (10.35)	736 (28.98)
APC Smart-UPS RT 10 kVA Rack Tower 208 V	SURT10000RMXLT6U	110.9 (244.0)	263 (10.35)	432 (17.00)	736 (28.98)
APC Smart-UPS RT 10 kVA 208 V	SURT10000XLT	110.9 (244.0)	432 (17.00)	263 (10.35)	736 (28.98)
APC Smart-UPS RT 15 kVA RM 208 V	SURT15KRMXLT	247.7 (545.0)	533 (20.98)	432 (17.00)	773 (30.43)
APC Smart-UPS RT 20 kVA RM 208 V	SURT20KRMXLT	247.7 (545.0)	533 (20.98)	432 (17.00)	773 (30.43)

**B. System Characteristics**

**1. System Capacity:**

- a. 1.5 kVA or 1050 W whichever limit is reached first (for the 1.5 kVA model).
- b. 2.2 kVA or 1600 W whichever limit is reached first (for the 2.2 kVA model).
- c. 3 kVA or 2100 W, whichever limit is reached first (for the 3 kVA models).
- d. For the 5 kVA model (208 V/208 V), 5 kVA or 3500 W, whichever limit is reached first.
- e. For the 6 kVA model (208 V/208 V), 6 kVA or 4200 W, whichever limit is reached first.



f. For the 5 kVA and 6 kVA split-phase models:

Model	Maximum Output with Standard Plug, 50-60 Hz	
	Maximum Output per Phase at 100 V/120 V, Split-Phase	Maximum Output at 200 V/208 V (Line – Line Loading)
SURTD5000RMXLP3U	2.5 kVA, 2000 W, 120 V, 21 A	4.35 kVA, 3500 W, 208 V, 21 A
SURTD6000RMXLP3U	2.88 kVA, 2100 W, 120 V, 24 A	5 kVA, 3675 W, 208 V, 24 A
Model	Maximum Output with Input Hardwired, 50-60 Hz	
	Maximum Output per Phase at 100 V/120 V, Split-Phase	Maximum Output at 200 V/208 V (Line – Line Loading)
SURTD5000RMXLP3U	2.5 kVA, 2000 W, 120 V, 21 A	4.35 kVA, 3500 W, 208 V, 21 A
SURTD6000RMXLP3U	3 kVA, 2100 W, 120 V, 25 A	5.2 kVA, 3675 W, 208 V, 25 A

- g. 8 kVA or 6.4 kW, whichever limit is reached first (for the 8 kVA models).
- h. 10 kVA or 8 kW, whichever limit is reached first (for the 10 kVA models).
- i. 15 kVA or 12,000 W, whichever limit is reached first (for the 15 kVA model).
- j. 20 kVA or 16,000 W, whichever limit is reached first (for the 20 kVA model).
2. **Efficiency:** The UPS efficiency stated here is at full load and without degradation of output regulation as specified:
- Efficiency is at least 89% for the 1.5 kVA and 2.2 kVA models.
  - Efficiency is between 85% and 88% for the 3 kVA models with 120 V Output / 120 V Input.
  - Efficiency is at least 92% for the 3 kVA models with 120 V, 208 V Output / 208 V Input and the 3 kVA models with 208 V Output / 208 V Input.
  - Efficiency is between 90% and 93% for the 5 kVA to 10 kVA models.
  - Efficiency is at least 94% for the 15 kVA and 20 kVA models.
3. **Input:**
- AC Input Nominal Voltage:**
    - 120 Vac, single-phase, 5-20P (2. kVA model) or 5-15P (1.5 kVA model).
    - 120 Vac, single-phase, L5-30P (3 kVA model). An input/output hardwire kit is optional for this model.
    - 208/240 Vac, single-phase, L6-30P (for 3 kVA model). An input/output hardwire kit is optional for this model.
    - 208/240 Vac, single-phase, L6-30P (for 5 kVA, and 6 kVA models).
    - 120/208 Vac, split-phase, L14-30P (5 kVA, and 6 kVA models). An input/output hardwire kit is optional for these models.
    - 208/240 Vac, single-phase, 3-wire (2Ph + G): 8 kVA and 10 kVA models.
    - 208/240 Vac, single-phase, 3-wire (2Ph + G): 15 kVA and 20 kVA models.
  - AC Input Voltage Window:**
    - For 1500, and 2200 Vac (L-N) models, while providing nominal charging to the battery system:
      - 90 – 150 Vac (L-N) at full load.
      - 50 – 150 Vac (L-N) at 50% load.
    - For 3 kVA, 5 kVA, and 6 kVA single phase models, while providing nominal charging to the battery system:
      - 160 – 280 Vac (L1-L2) at full load.
      - 100 – 280 Vac (L1-L2) at 50% load.
    - For 5 kVA and 6 kVA split-phase models:
      - Full Load, 85 - 138 (Line to Neutral) Vac, per phase.
      - Half Load, 50 - 138 (Line to Neutral) Vac, per phase.
    - For 8 kVA and 10 kVA models:
      - 160 – 280 Vac (L1-L2) at full load.
      - 100 – 280 Vac (L1-L2) at 50% load.
    - For the 15 kVA and 20 kVA models, while providing nominal charging to the battery system:
      - 160 – 275 Vac (Line-Line) at full load.

- b) 100 -- 275 Vac (Line-Line) at 50% load.
- c. **Input Frequency Range:** 45-65 Hz, auto-selecting, for 1.5 kVA to 10 kVA models and 40-70 Hz, auto-selecting, for 15 kVA and 20 kVA models
- d. **Input Power Factor:** >0.95 @ 100% load
- e. **Input Current Distortion:**
  - 1) Maximum 8% at 100% load at nominal voltage (for 1.5 kVA, 2 kVA, and 2.2 kVA models)
  - 2) <10% at 100% load for APC Smart-UPS RT 5 kVA Rack /Tower 208 V (SURTD5000RMXLP3U and APC Smart-UPS RT 6 kVA Rack/Tower 208 V (SURTD6000RMXLP3U)
  - 3) Maximum 6% at 100% load at nominal voltage for the following models:
    - a) 3 kVA models
    - b) APC Smart-UPS RT 5 kVA 208 V (SURTD5000XLT), APC Smart-UPS RT 6 kVA 208 V (SURT6000XLT), APC Smart-UPS RT 5 kVA RM 208 V (SURTD5000RMXLT3U), and APC Smart-UPS RT 6 kVA RM 208 V (SURT6000RMXLT3U)
    - c) 10 kVA models
  - 4) < 4% at 100% load, 208 Vac (15 kVA and 20 kVA models)

4. **UPS Output:**  
a. **AC Output Nominal Voltage:**

<b>Nominal Output Voltage</b>	<b>APC Smart-UPS RT models</b>
120 V	1.5 kVA Rack/Tower 120 V (SURTA1500RMXL2U) 1.5 kVA 120 V (SURTA1500XL) 2.2 kVA RM 120 V (SURTA2200RMXL2U) 2.2 kVA 120 V (SURTA2200XL) 3 kVA Rack/Tower 120 V (SURTA3000RMXL3U) 3 kVA 120 V (SURTA3000XL)
120 V, 208 V, 220 V, 240 V	3 kVA 208V with 208 V to 120 V Step-Down Transformer (SURTD3000XLT-1TF3) 3 kVA Rack- Mount 208 V with 208 V to 120 V Step-Down Transformer (SURTD3KRMXL3U-TF5) 5 kVA 208 V with 208 V to 120 V Step-Down Transformer (SURTD5000XLT-1TF3) 6 kVA 208 V with 208 V to 120 V Step-Down Transformer (SURT6000XLT-1TF3) 6 kVA RM 208 V with 208 V to 120 V 2 U Step-Down Transformer (SURT6KRMXL3U-TF5) 6 kVA RM 208 V to 208/120 V (SURTD6000RMXLP3U) 8 kVA 208 V with 208 V to 120 V Step-Down Transformer (SURT8000XLT-1TF3) 8 kVA RM 208 V with 208 V to 120 V 2 U Step-Down Transformer (SURT8KRMXL6U-TF5) 10 kVA 208 V with 208 V to 120 V Step-Down Transformer (SURT10000XLT-1TF10K) 10 kVA 208 V with (2) 208 V to 120 V Step-Down Transformers (SURT10000XLT-2TF3) 10 kVA RM 208 V with (2) 208 V to 120 V 2 U Step-Down Transformers (SURT10KRMXL6U-TF5) 15 kVA RM 208 V with 208 V to 120 V 10 kVA Step down Transformer (SURT15KRMXLT-1TF10K) 15 kVA RM 208 V with 208 V to 120 V 5 kVA Step-Down Transformer (SURT15KRMXLT-TF5) 20 kVA RM 208 V with 208 V to 120 V 10 kVA Step-Down Transformer (SURT20KRMXLT-1TF10K) 20 kVA RM 208 V with 208 V to 120 V 5 kVA Step-Down Transformer (SURT20KRMXLT-TF5)
208 V, 220 V, 240 V	3 kVA Rack Tower 208 V (SURTD3000RMXL3U) 3 kVA 208 V (SURTD3000XLT) 5 kVA Rack Tower 208 V (SURTD5000RMXL3U) 5 kVA 208 V (SURTD5000XLT) 6 kVA Rack/Tower 208 V (SURT6000RMXL3U) 6 kVA 208 V (SURT6000XLT) 8 kVA Rack/Tower 208 V (SURT8000RMXL6U) 8 kVA 208 V (SURT8000XLT) 10 kVA Rack/Tower 208 V (SURT10000RMXL6U) 10 kVA 208 V (SURT10000XLT) 15 kVA RM 208 V (SURT15KRMXLT) 20 kVA RM 208 V (SURT20KRMXLT)

- b. **Output Connectors:**
- 1) For 1.5 kVA, and 2.2 kVA models: 6 NEMA 5-15R.
  - 2) For 3 kVA, 5 kVA (SURTD5000XLT and SURTD5000RMXLT3U), and 6 kVA models (SURT6000XLT and SURT6000RMXLT3U): (2) NEMA L6-20R and (2) NEMA L6-30R
  - 3) For 5 kVA (SURTD5000RMXLP3U ) and 6 kVA (SURTD6000RMXLP3U) models: (1) L6-30R, (1) L14-30R and (4) 5-20R.
  - 4) For 8 kVA and 10 kVA models: Hardwire 3 wire (L1 + L2 + G), 2 NEMA L6-20R and 2 NEMA L6-30R.
  - 5) For 15 kVA, and 20 kVA models:
    - a) Hardwire: 3-wire (2Ph + G)
    - b) Outlets: (4) NEMA L6-20, (2) NEMA L6-30 (when battery module is used)
- c. **AC output voltage distortion:**
- 1) Maximum 3% @ 100% linear load; maximum 8% @ 100% non-linear (1.5 kVA and 2.2 kVA models)
  - 2) Maximum 2% @ 100% linear load; Maximum 5% @ 100% non-linear load (3 kVA to 20 kVA models)
- d. **AC output static voltage regulation:** +/-2% for 1.5 kVA and 2.2 kVA models; +/-1% for models of 3 kVA and higher.
- e. **AC output dynamic voltage regulation:**
- 1) +/-5%, for 10 to 90% load step at <50 ms recovery time:
    - a) For 5 kVA (SURTD5000RMXLP3U ) model
    - b) For 6 kVA (SURTD6000RMXLP3U) model:
  - 2) +/- 8% maximum for 100% load step at <10 ms recovery time:
    - a) For 1.5 kVA and 2.2kA models
    - b) For 3 kVA models.
    - c) For 5 kVA models (SURTD5000XLT and SURTD5000RMXLT3U)
    - d) For 6 kVA models (SURT6000XLT and SURT6000RMXLT3U)
    - e) For 8 kVA to 20 kVA models
- f. **Output Voltage Harmonic Distortion:**
- 1) <2% THD maximum for a 100% linear load
  - 2) <5% THD maximum for a 100% non-linear load
- g. **Overload Rating:**
- 1) **Normal Operation (Online):**
    - a) 150% for 30 seconds
    - b) 125% for 1 minute
    - c) 105% continuous
  - 2) **Bypass Operation:** Overload is limited by the external input circuit breaker feeding the UPS:
    - a) A supplementary 10 A circuit breaker is fitted at the input of the 1.5 kVA model
    - b) A supplementary 16 A breaker is fitted at the input of the 2.2 kVA model.
    - c) A supplementary 16 A circuit breaker is fitted at the input of the 3 kVA (SURTD3000XLT and SURTD3000RMXLT3U) models, and 30 A for the 3 kVA (SURTA3000XLT and SURTA3000RMXL3U) models.
    - d) A supplementary 32 A circuit breaker is fitted at the input of the 5 kVA (SURTD5000XLT and SURTD5000RMXLT3U) and 6 kVA (SURT6000XLT and SURT6000RMXLT3U) models.
    - e) A supplementary 30/32 A circuit breaker is fitted at the input of the 5 kVA (SURTD5000RMXLP3U), and 6 kVA (SURTD6000RMXLP3U) models.
    - f) A supplementary 50 A /2-pole circuit breaker is fitted at the input of the 8 kVA model.
    - g) A supplementary 70 A /2-pole or 63 A/2-pole circuit breaker is fitted at the input of the 10 kVA model.
    - h) A supplementary 100 A /2-pole circuit breaker is fitted at the input of the 15 kVA model.
    - i) A supplementary 125 A /2-pole circuit breaker is fitted at the input of the 20 kVA model.

- h. **Output Power Factor Rating:**
  - 1) For 5 kVA (SURTD5000RMXLP3U ) and 6 kVA (SURTD6000RMXLP3U) models, 0.5 lagging to 0.5 leading.
  - 2) For 1.5 kVA, 2.2 kVA, 3 kVA, 5 kVA (SURTD5000XLT and SURTD5000RMXLT3U), and 6 kVA (SURT6000XLT and SURT6000RMXLT3U) models.
    - a) 0.2 –1.0 lagging
    - b) Nominal: 0.7 lagging.
  - 3) For 8 kVA to 20 kVa models
    - a) 0.2 –1.0 lagging
    - b) Nominal: 0.8 lagging.
- i. **Output Frequency:**
  - 1) For 1.5 kVA, 2.2 kVA, 3 kVA, 5 kVA (SURTD5000XLT and SURTD5000RMXLT3U), 6 kVA (SURT6000XLT and SURT6000RMXLT3U) models, and 8 kVA to 20 kVA models: 50/60 +/- 3 Hz tracking or 50/60 +/- 0.1 Hz tracking (user -selectable).
  - 2) For 5 kVA (SURTD5000RMXLP3U ) and 6 kVA (SURTD6000RMXLP3U) models: 50/60 +/- 3Hz (Tracking) or 50/60 +/- 0.1 Hz (free-running) or 50/60 +/- 1 Hz (free-running), user-selectable.
- j. **Crest Factor:** 3:1

## 1.5 SUBMITTALS

- A. **Proposal Submittals:**
  - 1. As bid system bill of materials.
  - 2. Product catalog sheets or equipment brochures.
  - 3. Product guide specifications.
  - 4. System single-line operation diagram.
  - 5. Installation information, including weights and dimensions.
  - 6. Information about terminal locations for power and control connections.
- B. **Delivery Submittals:**
  - 1. Installation manual, which includes instructions for storage, handling, examination, preparation, installation, and startup of UPS.
  - 2. User manual, which includes operating instructions.

## 1.6 PROJECT CONDITIONS

- A. **Environmental Requirements:** Do not install solid state UPS until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above ceilings is completed, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
  - 1. The UPS is capable of withstanding any combination of the following environmental conditions in which it must operate without mechanical or electrical damage, or degradation of operating characteristics.
    - a. **Storage Ambient Temperature:**
      - 1) +5° to +113° F (-15° to +45° C); charge the UPS battery every 6 months.
      - 2) +86° to +158° F (30° to +70° C); charge the UPS battery every 3 months.
    - b. **Operating Ambient Temperature:** 32°F to +104°F (0°C to +40°C). 77°F (25°C) is ideal for most battery types.
    - c. **Relative Humidity:** 0% to 95% non-condensing.
    - d. **Altitude:**
      - 1) **Storage Altitude:** 50,000 feet (15,000 meters) above sea level
      - 2) **Operating Altitude:** 10,000 feet (3000 meters) above sea level. At altitude of 10,000 feet the UPS must be loaded only up to 90% of its nominal capacity.
    - e. **Audible Noise:**
      - 1) For 1.5 kVA to 10 kVA models: <55 dBA at 100% load at 3 ft (1 m).
      - 2) For 15 kVA models: <50 dBA at 100% load at 3 ft (1 m).
      - 3) For 20 kVA models: <50 dBA at <75% load at 3 ft (1 m), <60 dBA at 100 % load at 3 ft (1m).

## 1.7 WARRANTY

- A. **Limited Warranty:** American Power Conversion (APC) warrants the UPS to be free from defects in materials and workmanship for a period of two years from the date of purchase,
1. **Warranty Limitations:**
    - a. The obligation of APC under this warranty is limited to repairing or replacing, at its own sole option, any defective product.
    - b. This warranty does not apply to equipment that has been damaged by accident, negligence, or misapplication or has been altered or modified in any way.
    - c. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.
    - d. EXCEPT AS PROVIDED HEREIN, AMERICAN POWER CONVERSION MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.
    - e. EXCEPT AS PROVIDED ABOVE, IN NO EVENT WILL APC BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Specifically, APC is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, costs of substitutes, claims by third parties, or otherwise.
    - f. This warranty gives you specific legal rights and you may have other rights that vary from state to state.
  2. **Warranty Procedures:**
    - a. To obtain service under warranty the purchaser must obtain a Returned Material Authorization (RMA) number from customer support.
    - b. Products must be returned with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Basis of Design:** Products specified are Smart-UPS RT Uninterruptible Power Supplies as manufactured by APC by Schneider Electric and as listed on page 2 of this specification. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect/Engineer will be the sole judge of the basis of what is equivalent.

### 2.2 MODES OF OPERATION

- A. **Normal:** The UPS output power stage (inverter) constantly recreates the UPS output voltage waveform by converting the DC bus voltage to AC voltage through a set of IGBT switches. In both online operation and battery operation, the output power stage (inverter) creates an output voltage waveform independent of the mains input voltage waveform. Input voltage anomalies such as brown-outs, spikes, surges, sags, and outages do not affect the amplitude or sinusoidal nature of the recreated output voltage sine wave of the output power stage (inverter). The input Power Factor Correction (PFC) power stage and the output power stage (inverter) operate in an on-line manner to continuously regulate power to the critical load. The input PFC stage is capable of full battery recharge while simultaneously providing regulated power to the load for all line and load conditions within the range of the UPS specifications.

1. **Overload Capability:** The output power stage (inverter) is capable of withstanding 150% overload for 30 seconds or 125% overload for 1 minute or 105% overload for an indefinite length of time.
  2. **Output Contactor:** The output power stage (inverter) is equipped with an output mechanical relay to provide physical isolation of the inverter from the critical bus. With this feature a failed inverter will be removed from the critical bus.
  3. **Battery Protection:** The inverter is provided with monitoring and control circuits to limit the level of discharge on the battery system.
- B. **Battery:** Upon failure of the AC input source, the critical load continues being supplied by the output inverter, which derives its power from the battery system. There is no interruption in power to the critical load during both transfers to battery operation and retransfers from battery to normal operation. The 15-20 kVA models provide a soft transfer from battery to on-line operation to avoid step load changes on the mains supply. The UPS battery system consists of user-replaceable, hot-swappable cartridges.
1. For 1.5 kVA and 2.2 kVA models, 1 battery cartridge must be installed.
  2. For 3 kVA to 6 kVA models, a minimum of two battery cartridges must be installed, providing 192 VDC nominal for the DC bus rail.
  3. For 8 kVA and 10 kVA models, a minimum of two battery cartridge pairs must be installed, one pair providing 192 VDC nominal for the positive DC bus rail and the other pair providing 192 VDC nominal for the negative DC bus rail.
  4. For 15 kVA to 20 kVA models, a minimum of four battery module pairs must be installed – two pairs providing 192 VDC nominal for the positive DC bus rail and the other two pairs providing 192 VDC nominal for the negative DC bus rail.
  5. The batteries of the UPS models in this specification are maintenance-free, leak-proof, valve-regulated lead-acid (VRLA) batteries with suspended electrolyte.
  6. The UPS incorporates the Intelligent Battery Management system to continuously monitor the health of each removable battery module as well as external battery modules installed in extended run battery cabinets. This system notifies the user in the event that a failed or weak battery module is found.
  7. You can add additional battery packs to increase runtime. These packs and the modules within them are hot-pluggable, allowing for easy and quick installation or replacement without the need for electrical wiring, electrician services or powering down of the UPS. The maximum number of external battery packs that may be connected to the UPS is unlimited for 1.5 kVA to 10 kVA models, and limited to 10 for 15 kVA and 20 kVA models.
  8. Each UPS Battery Module has a means of DC disconnect for transportation and to disconnect the battery module completely from the internal bus while the battery is installed in the UPS system.
  9. The UPS is shipped with battery modules preinstalled but disconnected.
- C. **Charging:** Upon restoration of the AC input source, the UPS simultaneously recharges the battery and provides regulated power to the critical load.
1. The intelligent battery management system contains a temperature monitoring circuit and compensation algorithm that regulates the battery charging voltage and current so as to optimize battery life. The UPS shall monitor the temperature of all battery packs and use the highest one as a reference to adjust the battery float voltage.
  2. The battery charging circuit remains active when in bypass or online states.
  3. For 15 kVA and 20 kVA models, the charging system automatically adjusts the maximum charger power, up to 3 kW, based on the installed battery capacity and current through each battery string to avoid excessive charging that could result in blotted batteries. Also for these models, Each battery pack reports its battery currents and temperature to the UPS through CAN communication
- D. **Bypass:** During bypass operation the utility power is connected to the load, bypassing the internal converters. The system automatic bypass provides a transfer of the critical load from the Inverter output to the automatic bypass input source during times when the inverter cannot support the load. The UPS constantly monitors the output current, as well as the bypass source voltage, and inhibits potentially unsuccessful transfers to automatic bypass from taking place. The design of the automatic bypass switch power path consists of a heavy-duty electromechanical bypass relay or contactor. For 15 - 20 kVA models the

bypass is a static switch. For models of 3 kVA through 10kVA, a system bypass switch is provided on the rear of the UPS. For the 15 kVA and 20 kVA m the bypass can be engaged through the user interface display at the front of the unit. All models can be put into manual bypass via software control.

1. **Automatic Transfers:** An automatic transfer of load to bypass takes place if the load on the critical bus exceeds the overload rating of the UPS, if both normal and battery operation modes are unavailable, if the UPS has an internal fault, or if for any reason the UPS cannot support the critical bus. Automatic transfers of the critical load from bypass back to normal operation takes place when the overload condition is removed from the critical bus output of the system or when other causes are corrected. If the bypass mode becomes unavailable the UPS will automatically switch to mains power. In the event that mains power is unavailable the system will switch to battery power.
2. **Manual Transfers:** Manually initiated transfers to and from bypass may be initiated through the UPS computer interface (via serial or USB communications) or (for models 5 kVA and higher) by engaging the bypass switch on the rear panel of the unit.

### 2.3 REMOVABLE INPUT/OUTPUT ELECTRICAL TERMINAL (15 kVA and 20 kVA models only)

- A. The input and output terminal connections are designed to be removable trays for easy electrical connection and unit removal.
- B. The removable input and output trays contain a means of configuring the system for 1 phase input and output.

### 2.4 INPUT PFC POWER STAGE

- A. **General:** The input Power Factor Correction (PFC) power stage of the UPS constantly rectifies the power imported from the mains input of the system, converting input mains AC power to DC power for precise regulation of the DC bus voltage, battery charging, and output power stage (inverter) regulated output power
- B. **Input Current Total Harmonic Distortion:** The input current THD<sub>i</sub> at full system load will be held to the following percentages while providing conditioned power to the critical load bus, and charging the batteries under steady-state operating conditions. This is true while supporting loads of both a linear or nonlinear type. This will be accomplished with no additional filters, magnetic devices, or other components.
  1. 8% or less for 1.5 kVA and 2.2 kVA models.
  2. 8.5% for 5 kVA (SURTD5000RMXLP3U) and 6 kVA (SURTD6000RMXLP3U) models.
  3. 6% or less for 3 kVA, 5 kVA (SURTD5000XLT and SURTD5000RMXLT3U), 6 kVA (SURT6000XLT and SURT6000RMXLT3U), and 10 kVA to 20 kVA models.
- C. **Input Current Limit:**
  1. The input converter shall control and limit the input current drawn from the utility supply to:
    - a. 150% of the UPS output for the 1.5 kVA, 2.2 kVA, and 3 kVA units.
    - b. 150% of the UPS output for the 5 kVA to 10 kVA units
    - c. 95 A for the 15 kVA unit.
    - d. 121 A for the 20 kVA unit
  2. During conditions where input current limit is active, the UPS shall be able to support 100% load, charge batteries at 10% of the UPS output rating, and provide voltage regulation with mains deviation of up to +/-20% of the nominal input voltage.
  3. In cases where the source voltage to the UPS is nominal and the applied UPS load is equal to or less than 100% of UPS capacity, input current shall not exceed 130% of UPS output current, while providing full battery recharge power and importing necessary power for system losses.
  4. For 15-20 kVA models, overloads at low line input voltages shall draw power from the battery, (battery assist mode) in order to support the load and maintain the input current below the set current limit points.



- D. **Charging:**
1. The battery charging circuit contains a temperature monitoring circuit, which regulates the battery charging current to optimize battery life.
  2. The battery charging circuit remains active when the UPS is in automatic bypass and in normal operation.
  3. The battery charging system adjusts the charging current according to the number of battery modules and by monitoring the individual battery current. Maximum charger power is:
    - a. 120 W for the 1.5 kVA and 2.2 kVA models.
    - b. 400 W for the 3 kVA models (120 Vac and 208 Vac).
    - c. 350 W for 5 kVA (SURTD5000RMXLP3U) and 6 kVA (SURTD6000RMXLP3U) models.
    - d. 400 W for the 5 kVA (SURTD5000XLT and SURTD5000RMXLT3U) and 6 kVA (SURTD6000XLT and SURTD6000RMXLT3U).
    - e. 800 W for the 8 kVA (SURT8000XLT and SURT8000RMXLT6U) and the 10 kVA (SURT10000XLT and SURT10000RMXLT6U).
    - f. 3 kW for 15 kVA to 20 kVA models.

## 2.5 OUTPUT POWER STAGE (INVERTER)

- A. **General:** The UPS output power stage (inverter) constantly recreates the UPS output voltage waveform by converting the DC bus voltage to AC voltage through a set of IGBT-driven power converters. In both normal operation and battery operation, the output power stage (inverter) creates an output voltage independent of the mains input voltage. Input voltage anomalies such as brown-outs, spikes, surges, sags, and outages, shall not affect the amplitude or sinusoidal nature of the recreated output voltage sine wave of the output power stage (inverter).
- B. **Overload Capability:** The output power stage (inverter) is capable of withstanding 150% overload for 30 seconds or 125% overload for 1 minute or 105% overload for indefinite length of time.
- C. **Output Contactor:** The output power stage (inverter) is equipped with an output mechanical contactor to provide physical isolation of the inverter from the critical bus. With this feature a failed inverter will be removed from the critical bus.
- D. **Battery Protection:** The inverter is provided with monitoring and control circuits to limit the level of discharge on the battery system.

## 2.6 DISPLAY AND CONTROLS

- A. **Control Logic:** The UPS is controlled by an embedded microcontroller which performs the following functions:
1. Monitoring the quality of the output voltage
  2. Monitoring vital parameters of the UPS
  3. Executing the state machine
  4. Intelligent battery management
  5. Controlling the input and output power stage
  6. Remaining runtime calculation
  7. Self-diagnostics, self-test, and proactive fault detection
  8. Communication to the host server via a serial port
  9. Communication to the Network Management Card or another SmartSlot accessory card, if the UPS is equipped with such a card
- B. **Display/Control Unit:** Located on the front of the UPS is a display/control unit comprised of 16 LEDs and 2 pushbutton switches (for 1.5 kVA to 10 kVA models) or an LCD display (15 kVA and 20 kVA models).
1. **Orientation:** The display/control unit may be turned 90 degrees clockwise or counterclockwise to accommodate the mounting orientation of the UPS as a tower UPS or as a rack-mounted UPS.

2. **Control Functions for All Models:** The following controls functions can be accomplished by use of the pushbutton switches or LCD display:
    - a. Turn the UPS on
    - b. Turn the UPS off
    - c. Initiate a self-test to test the battery condition
    - d. Silence an audible alarm
    - e. Cold-start the UPS
    - f. Display the input RMS voltage
  3. **Additional Control Functions for 15 kVA and 20 kVA models:**
    - a. Display or set the date and time
    - b. Transfer critical load to and from bypass
    - c. Set intervals for automatic battery tests
    - d. Adjust set points for different alarms
- C. **Data displayed on the Display/Control Unit (1.5 kVA to 10 kVA models):** The following indicators are available on the Display/Control Unit:
1. The UPS load LED bar
  2. The UPS is online
  3. The UPS is on battery
  4. The UPS is in bypass
  5. The UPS is overloaded
  6. The UPS is in fault state
  7. The battery needs to be replaced
  8. The battery capacity/utility voltage LED bar
- D. **Display Unit (15 kVA and 20 kVA models):** A microprocessor controlled display unit is located at the front of the system. The display consists of these components:
1. An alphanumeric display with backlight, providing system status
  2. LED alarm indicators
  3. A keypad consisting of pushbutton switches for control and status-reading selection.
- E. **Communication Interface:** The following are available and contained within the UPS for remote communications with a network via web browser or SNMP.
1. For 1.5 kVA, 2.2 kVA, and 120 V 3 kVA models, a DB-9 serial interface port.
  2. For 208 V 3 kVA and 208 V 5 kVA models, an RJ-45 serial interface port.
  3. For 6 kVA to 10 kVA models a DB-9 serial interface port.
  4. For models rated 5 kVA and higher, a pre-installed Network Management Card 2 with Environmental Monitoring (AP9631).
- F. **Bypass switch:** On the rear panel of the UPS (models rated 3 kVA through 10 kVA) there is a switch that when engaged forces the UPS into bypass state provided the input voltage and frequency are within acceptable limits.
- G. **EPO switch:** All UPS models documented in this specification are equipped with an Emergency Power Off (EPO) terminal that can be wired so as to provide the means to instantaneously de-energize the UPS and its load from a remote location in case of emergency.
- H. **Audible Alarms:** Using audio signal, the UPS will notify the user about important events. The following is the list of distinct audio alarms:
1. The UPS is on battery
  2. The UPS is on battery and the remaining battery capacity is low
  3. The UPS has shut down due to low battery capacity
  4. The battery needs to be replaced
  5. The UPS is overloaded
  6. The UPS is in fault state

- I. **Potential Free (Dry) Contacts:** The following potential free contacts are available on an optional APC SmartSlot Relay I/O Card (not compatible with the 208 V 5 kVA and 6 kVA models and 120/ 208 V split- phase 5 kVA and 6 kVA models):
  1. The UPS is on battery
  2. The UPS is on battery and the remaining battery capacity is low
  3. The UPS is off
  4. The battery needs to be replaced
  5. The UPS is in bypass
  6. The UPS is overloaded;
  7. The UPS is in fault state.

## 2.7 BATTERY

- A. The UPS battery is of modular construction made up of owner-replaceable, hot-swappable, fused, battery modules. Each battery module is monitored to determine the highest battery unit temperature for use by the UPS battery diagnostic, and temperature compensated charger circuitry.
- B. The batteries are of the valve regulated lead acid (VRLA) type.

## 2.8 ACCESSORIES

- A. **Service Bypass Panel (SBP):** As an optional accessory, a maintenance service bypass cabinet provides power to the critical load bus from the bypass source during times when maintenance or service of the UPS frame is required or removal of the whole unit is desired. The SBP provides a mechanical means of complete isolation of the UPS from the electrical wiring of the installation. The SBP is constructed in a stackable, rack-mounted or wall-mounted NEMA 1 enclosure unless otherwise stated in this specification. It is designed for single phase input and output with a “no-break” transfer between bypass and UPS power. For 5 kVA and 6 kVA models, the UPS shall have the option of a hardwire Input/Output kit to facilitate External Service Bypass connections.
- B. **Software and Connectivity:**
  1. **Network Management Card:** The Network Management Card allows one or more network management systems (NMSs) to monitor and manage the UPS in TCP/IP network environments. Models of 5 kVA and higher are equipped with a SmartSlot Network Management Card 2 with Environmental Monitoring (AP9631) as standard (pre-installed), which is available as an option on the 1.5 kVA to 3 kVA units.
  2. **Unattended Shutdown:** The UPS, in conjunction with a network interface card, is capable of gracefully shutting down one or more operating systems during the time when the UPS is on battery mode. The UPS is also capable of using an RS-232 port to communicate with the host computer by means of serial communications to gracefully shut down one or more operating systems during an on-battery situation. The PowerChute™ Business Edition software is provided with 1.5 kVA to 3 kVA models, and PowerChute™ Network Shutdown software is provided with 5 kVA to 20 kVA models.
- C. **Remote UPS Monitoring:** The following methods of remote UPS monitoring are available:
  1. **Web Monitoring:** Remote monitoring is available via a web browser such as Internet Explorer.
  2. **Dry Contact Monitoring and Control:** The UPS must be equipped with the APC SmartSlot Relay I/O Card to implement this type of monitoring. This feature is not available on SURTD models.

**D. Software Compatibility:**

1. **PowerChute™ Business Edition Basic (5-node) Software (PCBE):** This software is included with the 1.5 kVA to 3 kVA models. It supports graceful shutdown and remote monitoring for the following systems. (For more detailed information on Operating System compatibility, see [http://www.apcmedia.com/salestools/ASTE-6Z5QEV\\_R32\\_EN.pdf](http://www.apcmedia.com/salestools/ASTE-6Z5QEV_R32_EN.pdf).)
  - a. Microsoft Windows® Server 2011
  - b. Microsoft Windows® Server 2008
  - c. Microsoft Windows® Server 2003
  - d. Microsoft Windows® Storage Server 2008
  - e. Microsoft Windows HPC Server 2008
  - f. Microsoft Windows® 7
  - g. Microsoft Windows® Vista
  - h. Microsoft Windows® XP
  - i. Red Hat® Enterprise Linux®
  - j. SuSE® Linux®.Enterprise Server 11
  - k. Solaris™ 10
2. **PowerChute Network Shutdown:** This software is provided with the pre-installed Network Management Card 2 with Environmental Monitoring (AP9631) for models of 5 kVA and higher. It is compatible with the following operating systems.
  - a. IBM® AIX
  - b. HP/UX
  - c. Linux
  - d. Mac OS X
  - e. Novell NetWare
  - f. Solaris
  - g. Windows® 2003
  - h. Windows® 2008
  - i. Windows® 7
  - j. Windows® Vista
  - k. Windows® XP
3. **StruxureWare™ management software:** All Smart-UPS On-Line (Smart-UPS RT) Rack-Mount models are also certified for use with StruxureWare management software. Any of the following products can be purchased as an option:
  - a. StruxureWare Central Basic (AP9465)
  - b. StruxureWare Central Standard (AP9470)
  - c. StruxureWare Central Enterprise (AP9475)
  - d. StruxureWare Central Standard Management Pack (AP9480)
  - e. StruxureWare Central Basic Management Pack (AP9482)
  - f. StruxureWare Central Enterprise Management Pack (AP9485)

**PART 3 - EXECUTION**

**3.1 FACTORY-ASSISTED STARTUP**

If a factory assisted UPS start-up is requested, factory trained service personnel will perform the following inspections, test procedures, and on-site training.

- A. **Visual Inspection:**
  1. Inspect equipment for signs of damage.
  2. Verify installation per manufacturer s instructions.
  3. Inspect battery modules.
- B. **Mechanical Inspection:**
  1. Check all UPS and external service bypass panel internal power wiring connections.
  2. Check all UPS and external service bypass panel terminal screws, nuts, and/or spade lugs for tightness.
- C. **Electrical Inspection:**
  1. Verify correct input and bypass voltage.
  2. Verify correct UPS control wiring and terminations.
  3. Verify voltage of all battery modules.

4. Verify that neutral and ground conductors are properly landed.
5. Inspect external service bypass panel for proper terminations.

D. **Site Testing:**

1. Ensure proper system start-up.
2. Verify proper firmware control functions.
3. Verify proper firmware bypass operation.
4. Verify proper bypass switch operation (where applicable).
5. Verify proper inverter operation and regulation circuits.
6. Simulate utility power failure.
7. Verify proper charger operation.
8. Document, sign, and date all test results.

- E. **On-Site Operational Training:** During the factory assisted start-up, operational training for site personnel includes key pad operation, LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation, and alarm information.

### 3.2 FIELD QUALITY CONTROL

A. **Manufacturer Field Service:**

1. **Worldwide Service:** The UPS manufacturer has a worldwide service organization available, consisting of factory-trained field service personnel to perform startup, preventive maintenance, and service of the UPS system and power equipment. The service organization offers service support 24 hours a day, 7 days a week, 365 days a year.
2. **Replacement Parts:** Parts are available through the worldwide service organization 24 hours a day, 7 days a week, 365 days a year. The worldwide service organization is capable of shipping parts within four working hours or on the next available flight, so that the parts may be delivered to the customer site within 24 hours.

### 3.3 MAINTENANCE

- A. A complete offering of preventive and full service maintenance contracts for the UPS system and the battery system are available from APC by Schneider Electric. Contract work is performed by Schneider Electric factory-trained service personnel.

## END OF GUIDE SPECIFICATION

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