Eaton 9SX

700-3000VA Tower UPS

Guide Specification

1.1 Summary

This specification describes a continuous-duty, on-line, solid state uninterruptible power system, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to protect electronic equipment from power disturbances that may occur in utility power such as voltage fluctuations, brown-outs and blackouts, power surges and sags. The UPS shall provide high-quality AC power for sensitive electronic equipment loads.

1.2 Model Summary

This specification shall outline the performance characteristics of the following Eaton 9PX UPS models:

9SX700, 9SX1000, 9SX1000G, 9SX1500, 9SX1500G, 9SX2000, 9SX2000G, 9SX3000, 9SX3000G, 9SX3000GL

1.3 Standards

The UPS shall be designed in accordance with applicable sections of the current revision of the following documents:

- UL 1778 5th edition (UPS for USA)
- CSA C22.2 (UPS for Canada)
- RoHS EN 50581 2012
- IEC/EN 62040-1
- IEC/EN 62040-2
- IEC/EN 62040-3
- FCC part 15 Class B (120V, 3kVA models meet FCC part 15 Class A)
- CISPR22 Class B
- IEC 61000-3-2 Class 1
- IEC 61000-3-3 European limit
- IEC 61000-4-2 Criteria B (for 208V models)
- IEC61000-4-3 (Ed3.2) Criteria A
- IEC61000-4-4 Criteria B
- IEC61000-4-5 Criteria B
- IEC61000-4-6 Criteria A
- IEC61000-4-8 Criteria B
- IEC 61000-4-11 Criteria A
- ANSI C62.41 Category B3 (6kV ring and combination)

1.4 System Description

1.4.1 Modes of Operation

The UPS shall operate as an on-line double-conversion UPS with the following modes:

A. Normal mode: The rectifier shall derive power as needed from the commercial AC utility or generator source and supply filtered and regulated DC power to the on-line inverter. The inverter shall convert the DC power at its input to highly regulated and filtered AC power for the critical loads.

B. Hi efficiency mode: In the presence of favorable incoming utility conditions, the UPS shall optimize its operating state to maximize its efficiency (user selectable).

C. Battery mode: Upon complete failure of utility power, the UPS shall provide power to the critical loads through the inverter, from the internal or extended batteries. When utility power returns, the unit shall return to Normal operation.

D. By-Pass mode: The automatic bypass shall transfer the critical load to the commercial AC source, bypassing the UPS's inverter/rectifier, in the case of an overload, load fault, or internal failure.

E. Standby mode: When initially attached to a utility or other power source, the UPS shall start in standby mode until the user initiates power to the critical load. In this mode, the UPS shall recharge the batteries, but power shall not be supplied to the critical load.

1.4.2 Design Requirements

A. Inverter Output
   1. Maximum power ratings: (VA / W)
      a. 9SX700
         - 100/110/120/125V: 700VA / 630W
      b. 9SX1000
         - 100/110/120/125V: 1000VA / 900W
      c. 9SX1000G
         - 200/208/220/230/240V: 1000VA / 900W
      d. 9SX1500
         - 120/125V: 1500VA / 1350W
         - 110V: 1350VA / 1215W
         - 100V: 1200VA / 1080W
      e. 9SX1500G
         - 200/208: 1500VA / 1350W
         - 220/230/240V: 1500VA / 1500W

f. 9SX2000
   - 120/125V: 2000VA / 1800W
   - 110V: 1800VA / 1620W
   - 100V: 1600VA / 1440W

g. 9SX2000G:
   - 220/230/240V: 2000VA / 1800W
   - 208V: 2800VA / 1620W
   - 200V: 1600VA / 1440W

h. 9SX3000, 9SX3000HW
   - 120/125V: 3000VA / 2700W
   - 110V: 2700VA / 2430W
   - 100V: 2400VA / 2160W

i. 9SX3000G & 9SX3000GL:
   - 220/230/240V: 3000VA / 2700W
   - 208V: 2700VA / 2430W
   - 200V: 2400VA / 1440W

2. Nominal output voltage (user selectable):
   a. 9SX700, 9SX1000, 9SX1500, 9SX2000, 9SX3000, 9SX3000HW
      - 120V default (100/110/120/125V)
   b. 9SX1000G, 9SX1500G, 9SX2000G, 9SX3000G, 9SX3000GL
      - 208V default (200/208/220/230/240V)
3. Efficiency (full load, resistive load):
   a. 9SX700: 87%
   b. 9SX1000, 9SX1500, 9SX2000, 9SX1000G: 88%
   c. 9SX3000, 9SX3000HW: 89%
   d. 9SX2000G, 9SX3000G, 9SX3000GL: 92%
4. Current overload capability:
   a. The UPS shall attempt to clear overloads while remaining on inverter in normal operation (IT Mode) before transferring to bypass.
      - Transfer conditions:
        Transfer allowed by default if input voltage is within +15/-20% of nominal voltage and frequency is +/- 5Hz of nominal (50 or 60 Hz). Transfer can be disabled by user setting
      - Minimum time on bypass: 5s
      - On-line Transfer Time – Inverter to Bypass and Bypass to Inverter:
        - Synchronized: < 4 ms
        - Usynchronized: >10ms (or set to >20ms)
   b. Overload capability online (percent is per nominal Watt/VA);
      - 100%-102%: overload warning
      - 102%-130%: transfer to bypass after 12s
      - 130%-150%: transfer to bypass after 2s
      - >150%s: immediate transfer to bypass

c. Overload on battery
   - 100%-130%: 12 seconds
   - >130%: 2 seconds

d. Overload on bypass
   - 100%-110%: overload warning
   - 110%-130%: Shutdown after 5 min
   - 130%-150%: Shutdown after 15 sec
   - >150%: Shutdown after 300ms

5. Waveform: Pure sinewave
6. Voltage regulation, static, online:
   a. ±2% (steady state)
7. Battery mode voltage regulation: static:
   a. +/3% RMS for entire battery voltage range and 0-100% laod
8. Output voltage distortion THDV% in normal mode:
   a. Resistive load: <3% linear load (<4% at low battery)
   b. SMPS load: <3% linear load (<7% at low battery)
9. Dynamic voltage regulation (line mode with resistive load):
   a. 20% → 100% → 20% R load step: ±6%
10. Recovery time (up to 90% voltage recovery):
    a. 30ms with resistive load
11. Transient response:
    a. IEC 62040-3 Classification 1 (test method defined by IEC62040-3 Editon2 2011 for R load and non-linear load)

B. System input
   1. Input voltage range

      a. 120V Models:
         i. 700-1.5KVA
            a. ≤77.8% load (pf=.7): 60 / 70 / 80Vac to 138 VAC
            b. ≤88.8% load (pf=.8): 90Vac to 138 VAC
            c. 100% load (pf=.9): 100Vac to 138 VAC
         ii. 2-3kVA
            a. ≤77.8% load (pf=.7): 70 / 80 / 90Vac to 138 VAC
            b. ≤88.8% load (pf=.8): 95Vac - 138 VAC
            c. 100% load (pf=.9): 100Vac – 138 VAC
      b. 208V Models:
         i. 700-1.5KVA
            a. ≤77.8% load (pf=.7): 120 / 140 / 160Vac to 276 VAC
            b. ≤88.8% load (pf=.8): 180Vac to 276 VAC
            c. 100% load (pf=.9): 190Vac to 276 VAC
         ii. for 2-3KVA:
            a. ≤77.8% load (pf=.7): 140 / 160 / 180Vac to 276 VAC
            b. ≤88.8% load (pf=.8): 190Vac to 276 VAC

c. 100% load (pf=.9): 200Vac to 276 VAC

2. Input voltage hysteresis: Low +10V / High -10V (default)
3. Frequency – 50/60Hz
    a. Auto sensing upon initial startup
    b. Selectable through front menu
4. Frequency range
    a. 50Hz: 40-60Hz
    b. 60Hz: 50-70Hz
5. Frequency hysteresis: Low +0.5Hz / High -0.5Hz
6. Input power factor: ≥0.99
7. Input current distortion, THDi%: <5% at nominal input voltage, full load and battery fully charged

C. Batteries and Charger

1. Battery type: Valve Regulated Lead Acid (VRLA), non-spillable, lead acid cells, maintenance free
2. Extended run time: The UPS shall have capability for addition of four external battery modules (EBMs) to increase total runtime. Refer to Tables 1.3.2.C.b.i and ii for runtimes. Battery times are approximate and vary depending on load configuration and battery charge.
3. UPS Runtimes:

- 9SX700RT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
630W	11.3	37.4	67	99	134
600W	12.1	39.7	71	105	143
500W	15.8	49.5	89	132	178
400W	21.1	64	116	172	233
300W	29.4	89	161	239	-
200W	44.5	138	248	-	-

- 9SX1000RT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
900W	6.3	24.1	43	64	86
800W	7.7	27.8	50	74	99
700W	9.5	32.8	59	87	118
600W	12.1	39.7	71	105	143
500W	15.8	49.5	89	132	178
400W	21.1	64	116	172	233
300W	29.4	89	161	239	-
200W	44.5	138	248	-	-

- 9SX1000GRT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
900W	7.3	41.0	79	121	165
800W	8.6	46.7	90	138	188
700W	10.3	54	105	160	218
600W	12.6	65	125	190	259
500W	15.8	79	152	232	-
400W	20.4	100	192	293	-
300W	27.7	134	258	-	-
200W	41.5	200	-	-	-

- 9SX1500RT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
1350W	5.8	26.7	49.5	74	100
1200W	7.1	30.9	57	86	116
1050W	8.8	36.5	67	101	137
900W	11.2	44.2	81	122	165
750W	14.4	55.3	102	153	206
600W	19.2	72.0	133	199	268
450W	26.8	100.3	185	276	-
300W	41.9	157.3	289	-	-

- 9SX1500GRT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
1500W	5.0	25.1	46.4	69	94
1350W	5.8	28.2	52.0	78	105
1200W	6.9	32.2	60	89	120
1050W	8.5	37.7	70	104	140
900W	10.7	45.2	83	124	168
750W	13.9	55.6	102	153	207
600W	18.5	71	131	195	264
450W	25.8	95.7	176	263	-
300W	38.8	143	263	-	-

- 9SX2000RT, 9SX2000RTN runtimes

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
1800W	7.7	33.1	61	91	123
1620W	9.1	37.6	70	104	140
1440W	10.9	43	80	120	162
1260W	13.2	51	94	141	190
1080W	16.2	61	113	169	227
900W	20.2	76	139	208	281
720W	26.0	98	180	269	-
540W	35.8	136	250	-	-

360W	56.1	209	-	-	-

- 9SX3000RT, 9SX3000RTN runtimes

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
2700W	4.8	23.0	43	64	86
2430W	5.6	26.2	49	73	98
2160W	6.8	30	56	84	113
1890W	8.4	36	66	99	133
1620W	10.7	43	78	118	159
1350W	13.9	53	97	145	196
1080W	18.3	68	126	188	254
810W	24.6	95	176	262	-
540W	42.9	147	-	-	-

- 9SX2200GRT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
2000W	6.0	28.8	53	79	107
1800W	7.0	32.9	60	90	121
1600W	8.4	38	69	104	140
1400W	10.3	44	81	121	163
1200W	12.9	52	96	144	194
1000W	16.6	64	118	176	238
800W	21.9	82	151	225	304
600W	30.1	112	206	-	-
400W	46.0	170	-	-	-

- 9SX3000GRT, 9SX3000GLRT

Load	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
3000W	3.8	20.0	37.0	54.9	74
2700W	4.5	23.0	42.2	63	85
2400W	5.4	26.7	48.7	73	99
2100W	6.6	31.2	57.1	86	116
1800W	8.3	37.2	68	102	138
1500W	10.8	45.7	84	125	170
1200W	14.9	59.0	108	162	219

900W	21.8	82	151	225	304
600W	34.0	125	231	345	466

4. Battery replacement – When not on battery, the UPS shall have batteries that are capable of being hot-swappable by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
5. Advanced Battery Management – The UPS will provide Advanced Battery Management that uses sophisticated sensing circuitry and a three-stage charging technique that extends the used service life of the UPS batteries while optimizing the battery recharge time. Additionally, the UPS should be able to provide up to 60 days' notice of the end of useful battery service life to aid in scheduling of battery replacement.
6. Auto Battery Test – If customer does not use Advanced Battery Management and uses a constant charging mode, the UPS will perform an auto battery test with a factory default set at once per week to determine the overall health of the battery. This interval should be settable to select either no test, every day, every week, or every month.

D. Form Factor
   1. The UPS shall be a pure tower form factor

E. Weights and Dimensions:
   1. The UPS shall have the following weights and dimensions:

Catalog number	Dimensions (HxWxD, in.)	Weight (lb.)
120V output, 50/60 Hz bundles		
9SX700	9.9 x 6.3 x 13.9	26.5
9SX1000	9.9 x 6.3 x 15.1	30.9
9SX1500	9.9 x 6.3 x 17.1	41.9
9SX2000	13.6 x 8.4 x 16.2	77.2
9SX3000	13.6 x 8.4 x 16.2	77.2
9SX3000HW	13.6 x 8.4 x 16.2	77.2
208V output, 50/60 Hz bundles		
9SX1000G	9.9 x 6.3 x 15.1	30.9
9SX1500G	9.9 x 6.3 x 17.1	41.9
9SX2000G	13.6 x 8.4 x 16.2	77.2
9SX3000G	13.6 x 8.4 x 16.2	77.2
9SX3000GL	13.6 x 8.4 x 16.2	77.2
External Battery Modules (EBMs)		
9SXEBM36T	9.9 x 6.3 x 13.9	41.8
9SXEBM48T	9.9 x 6.3 x 17.0	52.9
9SXEBM96T	13.6 x 8.4 x 16.2	110.2

F. Input connection

1. 9SX700, 9SX1000, 9SX1500: 5-15P
2. 9SX2000: 5-20P
3. 9SX3000: L5-30P
4. 9SX3000HW: Input terminal block
5. 9SX1000G, 9SX1500G: C14
6. 9SX2000G: C14 (C13-L6-20P 6-ft jumper provided)
7. 9SX3000G, 9SX3000GL: C20 (C19-L6-20P 8-ft jumper provided)

G. Output receptacles
1. 9SX700, 9SX1000, 9SX1500: (6) 5-15R
2. 9SX2000: (1) L5-20R, (6) 5-20R
3. 9PX3000: (1) L5-30R, (6) 5-20R
4. 9PX3000HW: Output terminal block
5. 9SX1000G, 9SX1500G: (6) C13
6. 9SX2000G: (8) C13
7. 9PX3000G: (1) C19, (8) C13
8. 9PX3000GL: (1) L6-30R, (2) L6-20R, (2) 6-20R

1.4.3 Display and Controls

A. Local display:
1. The UPS shall be provided with a full graphical LCD display that provides the information and access to all settings and control features of the UPS.
2. The main status screen shall include all the following information at a single view:
   a. UPS mode status
   b. Load information:
      - Load Wattage
      - Load VA
      - Load Percentage
      - Graphical representation of load %
   c. Battery Condition
      - Battery Charge Percentage
      - Estimated Runtime
      - Number of EBM’s connected
      - Graphical representation of battery %
   d. Alert / Alarm conditions
   e. Efficiency

B. User menu:
1. Controls will consist of a 5 button configuration including:
   - ESC – Exit menu item / cancel changes
   - UP – Go to previous screen or menu/value selection
   - DOWN – Go to next screen of menu/value selection
   - ENTER – Enter menu or select value

- On/Off Button

1.4.4 Communications Option

A. Network Card
   1. UPS shall include one communications slot that will allow the operator to field install an network communications card [Eaton Gigabit Network Card-M2 or equivalent]. The network card must be hot-installable, must be UL2900-2-2 listed and provide the minimum features described below:

      a. The network communications card must be hot-installable.
      b. Communicates with SNMPv3 and IPv6
      c. Communicate natively with 1GB networks
      d. Supports IETF UPS MIB
      e. Supports redundant UPS configurations
      f. Allows control of UPS managed load segments
      g. Manual and scheduled on/off controls of UPS
      h. Capable of mass firmware upgrades
      i. Capable for mass configuration

B. RS232 serial Communication
   1. The UPS will provide a RS232 serial connection. Cable provided to provide DB-9 interface.

C. USB
   1. The UPS will provide a USB connection that is HID compliant for network connection

D. RPO port / programmable signal inputs
   1. The UPS will provide a Remote Power Off (RPO) port that can be programmed for the functions listed below through the front menu. Programming will be native and will not require specialized firmware:
      a. RPO (Remote Power Off) – Allow a remote contact to be used to disconnect power to the UPS and all devices attached. Restarting the UPS requires manual intervention.
      b. ROO (Remote On/Off) – Allows remote contact to be used to turn the UPS On and Off. Resetting the contact to the normal position will automatically return the UPS back to normal state without manual intervention through the front menu.
      c. Forced bypass – If feeding the load, the unit shall go to bypass operation and stays there regardless of the bypass state until the input is inactivated.
      d. Building alarm – Active input generates an alarm, “building alarm”
      e. On generator – Active input disables synchronization and transfers to bypass
      f. Remote shutdown – Active input turns the UPS output (or outlet groups) off after a user defined shutdown delay, but keep charging batteries according to selected charging scheme. Inactive input does not abort shutdown countdown.

1.5 Management Software

The UPS will be compatible with power management software [Eaton Intelligent Power Software Suite (IPSS) or equivalent]. This software will perform the following actions:

- Monitors power consumption at the load segment level
- Support redundant UPS configuration
- Lightweight software, not running in JRE
- Mass update of network card firmware
- Plugs into dashboard of major Virtualization players. Allows for monitor of power equipment through the same dashboard that the Virtualized data center uses.
- Triggers movement of virtual machines to avoid shutdown of server facing imminent power disruption

1.6 Warranty

The UPS will have a warranty that covers both the UPS electronics and the internal batteries for 2 years with product registration in the U.S. and Canada.

1.7 Environmental conditions

A. Operating temperature: 0 to 40°C (32°F to 104°F)
B. Storage temperature: 0 to 35°C (32°F to 95°F)
C. Storage temp less battery: -25 to 55°C (-13°F to 131°F)
D. Relative humidity: 0 to 96%
E. Surge suppression: IEEE ANSI C62.41 Cat B3 (6 KV Ring and Combination)
F. Audible noise: < 50 dBA at 1 meter typical