

# Eaton 93PM 60-250 kVA UPS Technical Specification

Manufacturer's declaration in accordance with IEC 62040-3

| IEC 62040-3 Subclause | MODEL RATING (0.9 pf)                           | 60 kVA                                     | 60-120 kVA    | 180 kVA       | 60-250 kVA  |
|-----------------------|-------------------------------------------------|--------------------------------------------|---------------|---------------|-------------|
|                       | Model catalogue reference                       | 93PM-XX(60)                                | 93PM-XXX(120) | 93PM-XXX(250) |             |
|                       | Number of UPM's (Uninterruptible Power Modules) | 1 UPM                                      | 1...2 UPM's   | 3 UPM's       | 1...4 UPM's |
|                       | UPS Options:                                    |                                            |               |               |             |
|                       | Internal batteries, standard or long life       | X                                          |               |               |             |
|                       | Internal Battery Breaker (BB)                   | Default                                    | X             |               |             |
|                       | Internal maintenance bypass (MBS)               | X                                          | X             |               |             |
|                       | Top Cable Access (C)                            | X                                          | X             | Default       | Default     |
|                       | Plywood package                                 | X                                          | X             | X             | X           |
|                       | Upgradeability                                  | -                                          | up to 120 kVA | up to 250 kVA |             |
|                       | External paralleling                            | Up to 8 units with HotSync technology      |               |               |             |
| 5.1.1                 | UPS topology                                    | Double conversion, 3-level IGBT converters |               |               |             |
| 5.3.4                 | UPS performance classification                  | VFI-SS-111                                 |               |               |             |

## MECHANICAL

|  |                                                              |                                                              |                                 |                                                   |                                                                     |
|--|--------------------------------------------------------------|--------------------------------------------------------------|---------------------------------|---------------------------------------------------|---------------------------------------------------------------------|
|  | UPS dimensions (width x depth x height)                      | 560 x 914 x 1876 mm                                          |                                 | 760 x 914 x 1876 mm                               |                                                                     |
|  | UPS dimensions with top air exhaust (width x depth x height) | N/A                                                          | 560 x 1114 x 1876 mm            | 760 x 1114 x 1876 mm                              |                                                                     |
|  | Shipping weight, UPS and internal batteries                  | UPS+0bat: 330 kg<br>UPS+5bat: 845 kg<br>UPS+6bat: 945 kg     | 1 UPM: 337 kg<br>2 UPMs: 408 kg | 1 UPM: 378 kg<br>2 UPMs: 443 kg<br>3 UPMs: 508 kg | 1 UPM: 431 kg<br>2 UPMs: 496 kg<br>3 UPMs: 561 kg<br>4 UPMs: 626 kg |
|  | Installed weight, UPS and internal batteries                 | UPS+0bat: 288 kg<br>UPS+5bat: 773 kg<br>UPS+6bat: 870 kg     | 1 UPM: 267 kg<br>2 UPMs: 338 kg | 1 UPM: 279 kg<br>2 UPMs: 341 kg<br>3 UPMs: 438 kg | 1 UPM: 346 kg<br>2 UPMs: 408 kg<br>3 UPMs: 471 kg<br>4 UPMs: 556 kg |
|  | UPS Cable entry                                              | Bottom / rear entry<br>Top entry with optional kit           |                                 | Top / bottom / rear entry                         |                                                                     |
|  | UPS Degree of protection                                     | IP20 (EN60529), with front door mounted washable dust filter |                                 |                                                   |                                                                     |
|  | UPS colour                                                   | Black, RAL 9005                                              |                                 |                                                   |                                                                     |
|  | Mean time to repair (MTTR)                                   | < 30 minutes                                                 |                                 |                                                   |                                                                     |

## ENVIRONMENTAL

|                       |                                                                                          |                                                                                                                                                                                                                        |                                                  |
|-----------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 6.5.5                 | Acoustic noise at 1m, in 25 °C ambient temperature                                       | < 60 dBA in double conversion<br>< 47 dBA in ESS                                                                                                                                                                       | < 65 dBA in double conversion<br>< 47 dBA in ESS |
| 4.1.4                 | Ambient storage temperature range<br><br>UPS<br><br>Internal and External VRLA battery   | -25 °C to +55 °C in the protective package<br><br>-25 °C to +25 °C in the protective package*<br><i>*Recommended for optimized battery life time</i>                                                                   |                                                  |
| 4.2.1.1 and 5.4.2.2 h | Ambient operating temperature range<br><br>UPS<br><br>Internal and External VRLA battery | 0 to +35 °C<br><i>The maximum rate of change shall be limited to 1.67 °C over 5 minutes (20 °C/hour), based on the ASHRAE standard 90.1-2013</i><br><br>+ 20 °C to + 25 °C recommended for optimized battery life time |                                                  |

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|-----------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------|------------|
| 4.2.1.1               | Relative humidity range during storage and operation | 5 to 95%, no condensation allowed<br><i>There shall be at least a 1.0 °C difference between the dry bulb temperature and the wet bulb temperature at all times, to maintain a non-condensing environment.</i>                                                                                                                    |            |         |            |
|                       | Airborne contaminants                                | Install in controlled indoor area, free of conductive contaminants (IEC 60947-1 pollution degree 2). Do not expose to overly aggressive environments like salt mist and/or corrosive gases. UPS should be installed in a G1 environment (based on ANSI/ISA S-71.04 classifications). Do not place near a source of dust or sand. |            |         |            |
| 4.2.1.2               | Operating altitude                                   | 1000 m above sea level at 35 °C<br>Maximum 2000 m with 1% de-rating per each additional 100m above 1000m                                                                                                                                                                                                                         |            |         |            |
|                       | RoHS/WEEE compliance                                 | Yes                                                                                                                                                                                                                                                                                                                              |            |         |            |

## EFFICIENCY

|                     |                                                    |        |         |         |         |
|---------------------|----------------------------------------------------|--------|---------|---------|---------|
| 5.3.2 r and 6.4.1.6 | Efficiency in double-conversion, rated linear load | 60 kVA | 120 kVA | 180 kVA | 250 kVA |
|                     | 100% load                                          | 96,1%  | 96,3%   | 96,3%   | 96,3%   |
|                     | 75% load                                           | 96,5%  | 96,6%   | 96,6%   | 96,6%   |
|                     | 50% load                                           | 96,6%  | 96,7%   | 96,7%   | 96,7%   |
|                     | 25% load                                           | 96,2%  | 96,1%   | 96,1%   | 96,2%   |
|                     | Heat dissipation in double conversion, [W]         | 60 kVA | 120 kVA | 180 kVA | 250 kVA |
|                     | 100% load                                          | 2190 W | 4150 W  | 6224 W  | 8645 W  |
|                     | 75% load                                           | 1470 W | 2851 W  | 4276 W  | 5939 W  |
|                     | 50% load                                           | 950 W  | 1843 W  | 2764 W  | 3839 W  |
|                     | 25% load                                           | 533 W  | 1096 W  | 1644 W  | 2222 W  |
|                     | No load                                            | 366 W  | 774 W   | 1132 W  | 1508 W  |
|                     | Efficiency in ESS, rated linear load               | 60 kVA | 120 kVA | 180 kVA | 250 kVA |
|                     | 100% load                                          | 99,2%  | 99,3%   | 99,3%   | 99,3%   |
|                     | 75% load                                           | 99,2%  | 99,2%   | 99,3%   | 99,3%   |
|                     | 50% load                                           | 99,1%  | 99,1%   | 99,1%   | 99,2%   |
|                     | 25% load                                           | 98,6%  | 98,6%   | 98,7%   | 98,8%   |
|                     | Heat dissipation in ESS                            | 60 kVA | 120 kVA | 180 kVA | 250 kVA |
|                     | 100% load                                          | 435 W  | 761 W   | 1142 W  | 1586 W  |
|                     | No load                                            | 128 W  | 291 W   | 382 W   | 511 W   |
|                     | Efficiency in stored energy mode, up to            | 95.5 % |         |         |         |

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|----------------------------|-------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------|---------|------------|
| ELECTRICAL CHARACTERISTICS |                                                                   |                                                   |                                               |         |            |
| INPUT                      |                                                                   |                                                   |                                               |         |            |
| 5.2.1 a and 5.2.1 b        | Rated input voltage                                               | 220/380 V; 230/400 V; 240/415 V                   |                                               |         |            |
|                            | Voltage tolerance                                                 | rated voltage -15% / +20%                         |                                               |         |            |
|                            | Rectifier input<br>Bypass input                                   | rated voltage -10% / +10%                         |                                               |         |            |
| 5.2.1 c and 5.2.1 d        | Rated input frequency                                             | 50 or 60 Hz                                       |                                               |         |            |
|                            | Frequency tolerance                                               | 42 to 72 Hz                                       |                                               |         |            |
| 5.2.2 a and 5.2.2 b        | Number of input phases                                            | 3 phases + neutral + PE                           |                                               |         |            |
| 5.2.2 d                    | Input power factor                                                | 0,99 at 100% load                                 |                                               |         |            |
|                            |                                                                   |                                                   |                                               |         |            |
|                            |                                                                   | 60 kVA                                            | 120 kVA                                       | 180 kVA | 250 kVA    |
| 5.2.2 c                    | Rated rectifier input current, 100% load without charging         | 82 A                                              | 164 A                                         | 246 A   | 341 A      |
| 5.2.2 f                    | Maximum rectifier input current                                   | 101 A                                             | 202 A                                         | 302 A   | 420 A      |
|                            | Rated Bypass input current                                        | 87 A                                              | 173 A                                         | 260 A   | 361 A      |
| 5.2.2 h and 5.2.2. i       | Input current distortion at rated input current<br>Resistive load | < 3%                                              |                                               |         |            |
|                            | Non-linear load                                                   | < 5%<br>(Up to 50kVA<br>reference NL-load)        | < 5%<br>(Up to100kVA<br>reference NL-load)    | < 5 %   |            |
| 5.2.2 e                    | In-rush current                                                   | ≤ 145 A                                           | ≤ 150 A                                       | ≤ 180 A | ≤ 380 A    |
| 5.2.2 k                    | AC power distribution system compatibility                        | TN, TT, IT (4-wire)                               |                                               |         |            |
|                            | Rectifier ramp-up, at rectifier start and load step               | 10 A/s (default), configurable.<br>Minimum 1 A/s. |                                               |         |            |
|                            | Backfeed protection                                               | Yes, for rectifier and bypass lines               |                                               |         |            |
|                            |                                                                   |                                                   |                                               |         |            |
| ELECTRICAL CHARACTERISTICS |                                                                   |                                                   |                                               |         |            |
| OUTPUT                     |                                                                   |                                                   |                                               |         |            |
| 5.3.2 k                    | Output power rating                                               | 60 kVA; 120 kVA; 180 kVA; 250 kVA                 |                                               |         |            |
|                            | Output power factor                                               | 0.9                                               |                                               |         |            |
| 5.3.2 o and 5.3.2 p        | Load power factor, permitted range                                | From 0,8 lagging to 0,8 leading without de-rating |                                               |         |            |
| 5.3.2 f and 5.3.2 g        | Number of output phases                                           | 3 phase + neutral + PE                            |                                               |         |            |
|                            | Crest factor                                                      | 1,8                                               |                                               |         |            |
| 5.3.2 b                    | Rated output voltage                                              | 220/380 V; 230/400 V; 240/415 V, configurable     |                                               |         |            |
|                            | Output voltage variation, steady state                            | < 1%                                              |                                               |         |            |
| 5.3.2 i                    | Total voltage harmonic distortion 100% linear load                | < 1,5 %                                           |                                               |         |            |
|                            | 100% non-linear load                                              | < 3 % *)<br>)Up to 50kVA<br>reference NL-load     | < 3 % *)<br>)Up to100kVA<br>reference NL-load | < 3 %   |            |

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|---------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|-------------------------------------------------|
| 5.3.2 q                         | Voltage unbalance at reference unbalanced load          | < 0,6%                                                                                                   |                                                |                                                |                                                 |
|                                 | Phase displacement at reference unbalanced load         | < 1,0 deg.                                                                                               |                                                |                                                |                                                 |
| 5.3.2 j                         | Voltage transient (r.m.s) and recovery time             | 0% during transfer from stored energy to normal mode<br><br>±5% with 140 ms recovery from 100% load step |                                                |                                                |                                                 |
| 5.3.2 c                         | Rated output frequency                                  | 50 or 60 Hz, configurable                                                                                |                                                |                                                |                                                 |
|                                 | Output frequency variation                              | ± 0,1 Hz                                                                                                 |                                                |                                                |                                                 |
| 5.3.2 d and<br>5.3.2 e          | Maximum frequency range for synchronization with bypass | ± 4 Hz as default. User settable ± 0,5 to ± 5 Hz.                                                        |                                                |                                                |                                                 |
|                                 | Maximum synchronized phase error                        | < 1° with static balanced load                                                                           |                                                |                                                |                                                 |
|                                 | Maximum slew-rate when synchronizing                    | 0,4 Hz/s                                                                                                 |                                                |                                                |                                                 |
| 5.3.2 l                         | Overload capability<br>On inverter                      | 60 sec 101-105% load<br>10 sec 106-125% load<br>400 ms >125% load                                        |                                                |                                                |                                                 |
|                                 | Overload capability<br>On inverter, stored energy mode  | 60 sec 101-105% load<br>400 ms >105% load                                                                |                                                |                                                |                                                 |
| 5.3.2 l                         | Overload capability<br>On bypass                        | Continuous < 115% load<br>10 ms 1000% load                                                               |                                                |                                                |                                                 |
| 5.3.2 m                         | Output current limitation, short-circuit capability     | 60 kVA<br>170 A, 400 ms                                                                                  | 120 kVA<br>345 A, 400 ms                       | 180 kVA<br>510 A, 400 ms                       | 250 kVA<br>670 A, 400 ms                        |
| 6.4.2.10.3<br>and<br>6.4.2.10.4 | Fault clearing capability                               | 35 A gL/gG fuse /<br>B25/C10 circuit<br>breaker                                                          | 35 A gL/gG fuse<br>/B50/C25 circuit<br>breaker | 63 A gL/gG fuse<br>/B63/C32 circuit<br>breaker | 63 A gL/gG fuse<br>/B100/C50 circuit<br>breaker |

## ESS MODE CHARACTERISTICS

|  |                                                                        |                                                                                                                                                                                              |
|--|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Transfer time to double-conversion<br>Mains available<br>Mains failure | No break<br><br>< 2 ms in normal transfer conditions, < 10 ms maximum                                                                                                                        |
|  | Output voltage variation setting                                       | ±10% of nominal voltage, default                                                                                                                                                             |
|  | Output frequency variation setting                                     | ±4 Hz, default                                                                                                                                                                               |
|  | Storm detection                                                        | UPS locks into double-conversion mode when three power line disturbances have forced the unit to double-conversion three times (user adjustable) within a one-hour period (user adjustable). |
|  | High Alert mode                                                        | UPS will stay on double-conversion for one hour (user adjustable), after which the unit will automatically return to operate on ESS.                                                         |

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|--------------------------|-----------------------|--------|------------|---------|------------|

## VMMS MODE CHARACTERISTICS

|  |                          |                                                                                                                                                                                                                                                                                                                                                            |
|--|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | VMMS Availability        | Available for multi-module 93PM UPS system, both between internal modules and modules in an external parallel connected system.                                                                                                                                                                                                                            |
|  | VMMS operation           | When load level per module is less than 80%, VMMS will automatically optimise the number of online modules for optimised operating efficiency.<br>The extra UPMS will be set to ready state mode, capable to transfer online in < 2ms transfer time.<br>The load will be fed in double conversion mode the entire time, even during and after a load step. |
|  | Redundancy level setting | Number of redundant online UPMS (system wide), configurable.                                                                                                                                                                                                                                                                                               |
|  | UPM module rotation      | System will automatically rotate the ready state UPMS.<br>Enabled by default, configurable.                                                                                                                                                                                                                                                                |

## BYPASS

|  |                                                          |                                                                           |                          |                          |         |
|--|----------------------------------------------------------|---------------------------------------------------------------------------|--------------------------|--------------------------|---------|
|  | Type of bypass                                           | Static                                                                    |                          |                          |         |
|  | Static Bypass rating                                     | 60 kVA                                                                    | 120 kVA                  | 250 kVA                  |         |
|  | Static Bypass voltage range                              | 220/380 V; 230/400 V; 240/415 V<br>tolerance -10% / +10% of rated voltage |                          |                          |         |
|  | Transfer time break                                      | No break                                                                  |                          |                          |         |
|  | Maintenance bypass                                       | Option, internal or external                                              |                          | Option, external         |         |
|  | Backfeed protection                                      | Integrated as standard                                                    |                          |                          |         |
|  | Rated conditional short-circuit current, I <sub>cc</sub> | 100 kA (internal ultra rapid fusing)                                      |                          |                          |         |
|  | Static bypass                                            |                                                                           |                          |                          |         |
|  | Optional internal Maintenance bypass                     | 10 kA*                                                                    | 25 kA*                   | N/A                      |         |
|  |                                                          | *using external protective fuse                                           |                          |                          |         |
|  | Internal static bypass ultra-rapid fuse                  | Bussmann 160LET                                                           | Bussmann 550 A 170M4465  | Bussmann 900 A 170M4419  |         |
|  | Bypass fuse i <sup>2</sup> t value                       |                                                                           |                          |                          |         |
|  | Pre-arc i <sup>2</sup> t                                 | 1 100 A <sup>2</sup> s                                                    | 96 100 A <sup>2</sup> s  | 155 000 A <sup>2</sup> s |         |
|  | Total clearing i <sup>2</sup> t                          | 16 000 A <sup>2</sup> s                                                   | 230 000 A <sup>2</sup> s | 850 000 A <sup>2</sup> s |         |
|  | External bypass protective fuse, recommended rating      | 60 kVA                                                                    | 120 kVA                  | 180 kVA                  | 250 kVA |
|  | 3x                                                       | 125 A                                                                     | 250 A                    | 315 A                    | 400 A   |

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|--------------------------|-----------------------|--------|------------|---------|------------|
|--------------------------|-----------------------|--------|------------|---------|------------|

## BATTERY CHARACTERISTICS

|           |                                                 |                                                                                                                                                                    |     |
|-----------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 5.4.2.2 d | Battery technology                              | 12 V, VRLA                                                                                                                                                         |     |
| 5.4.2.2 b | Battery quantity, internal batteries            | 36 blocks, 216 cells per battery string                                                                                                                            | N/A |
|           |                                                 | Note! Units with internal batteries only support 36 block string length                                                                                            |     |
|           | Battery quantity, external batteries            | 40 blocks, 240 cells per battery string                                                                                                                            |     |
|           |                                                 | Note! Never connect battery strings with different battery quantity and voltage in parallel. Units with internal batteries cannot be used with external batteries. |     |
| 5.4.2.2 c | Battery voltage, internal batteries             | 432 V (36 blocks)                                                                                                                                                  | N/A |
|           | Battery voltage, external batteries             | 480 V (40 blocks)                                                                                                                                                  |     |
| 5.4.2.2 o | Recharge profile                                | Advanced Battery Management (ABM®) = 90% resting, 10% charging (typical)<br>OR float charge                                                                        |     |
| 5.4.2.2 q | End of discharge voltage                        | 1.67 VPC to 1.75 VPC<br>Configurable or automatic (load adaptive)                                                                                                  |     |
| 5.4.2.2 r | Charging current at nominal load                | Configurable 0...29 A per UPM<br>At > 40 kVA load per UPM, automatically limited to 9 A per UPM                                                                    |     |
|           | Battery start                                   | Yes                                                                                                                                                                |     |
|           | Temperature compensated battery charging option | Yes, standard for internal batteries<br>Yes, with Environmental Monitoring Probe (EMP) for external batteries                                                      |     |
|           | Alternative backup power technologies           | Wet cell batteries<br>NiCd batteries<br>Lithium-ion batteries<br>Supercapacitors                                                                                   |     |

## COMMUNICATION CIRCUITS

|     |                                                    |                                                                                                                                                      |  |  |  |
|-----|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| 5.6 | Display                                            | Touchscreen LCD, 4x LEDs for notice and alarm, status LED light stripes                                                                              |  |  |  |
|     | Standard connectivity ports                        | 3x Mini-Slot ports for optional cards, Device USB and Host USB, RS-232 service port, 1 x relay output, 5 x building alarm inputs and a dedicated EPO |  |  |  |
|     | Optional                                           | Mini-Slot cards: Web/SNMP/Modbus, Industrial relay card                                                                                              |  |  |  |
|     | Complete list of indications and interface devices | See User's Manual                                                                                                                                    |  |  |  |

## COMPLIANCE WITH STANDARDS

|             |                                                         |                                                                                                                      |  |  |  |
|-------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--|--|--|
| IEC 62040-1 | Safety Access<br>Degree of protection                   | Restricted access<br>IP20; protection against medium sized foreign matter (incl. finger)<br>IP21 available as option |  |  |  |
| IEC 62040-2 | Electromagnetic Compatibility<br>Immunity and Emissions | EMC Category C3                                                                                                      |  |  |  |