

**Narada**<sup>®</sup>

**VALVE REGULATED SEALED LEAD  
ACID BATTERY**

**Eos Series**

**OPERATION  
MANUAL**

Version: V5.2

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**NARADA POWER SOURCE CO., LTD**


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## Safety and Warning


Please read this manual! It provides very important direction for fix and operation, which can make best capability for the equipment, and elongate the using life.


- For your safety, please do not try to dismantle or open the equipment. The equipment does not contain any spare parts for you. The maintain work can only be done by specially trained service persons.
- As a result of the batteries' latent endanger to health and environment, they should be only changed in our authorization service center. If you need to change the battery or maintain the equipment, please call the nearest service center.
- Batteries can be reclaimed, if it could not be carefully handled, it will do great harms to environment and heath. Please check local laws and regulations to get the validity handle ways or send the equipment to authorized service center.
- The replacement of battery can only be done by persons who know well about the danger and the prevention. When changing the battery, please use the same model and type of sealed lead acid battery.

 Warning—do not smoke or use fire near batteries。












 Warning—do not use organic solvent to wash batteries

 Warning—dot not put batteries into the fire, or it may bombed。

 Warning—do not open batteries, it contains electrolyte, which can hurt the skin and eyes.

 Warning—There may happen shock or short circuit when replacing the batteries. Please operate with tools with insulated handles.

Please take care of the following marks in using

|   |   |   |   |   |   |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| Warning   | Electricity danger  | Protecting your eye   | Watch Short-circuits  | With adults custody   | Do not put batteries into dustbin   |
|  |  |  |  |  |   |
| Read the manual   | Fire forbidden  | Circle used   | The product has past the UL authentication  | The product has past the CE authentication  |   |

## Chapter One Product introduction

### 1. Product Characters:

- Design life is above 15 years in float applications and cycle life is above 1200 times in 80% DOD (Depth of Discharge) term

Grid alloy with special patented formula

Special patented negative paste formula

4BS paste technology

Extra-thick plate design

- Reliable seal performance, no acid spillage, recombination efficiency reach 99%

Patented post sealing structure

“Labyrinth” patented security valve

High precise ABS sealing technology

- Initial capacity above 100%, the remaining capacity above 94% when storage for 3 months (25°C)

- Remarkable high rate discharge performance. Low internal resistance  
Patented grid design. Large section copper structure

- Supply the unique flexible connectors made of rubber wrapped with copper wires and another option is copper bar connector.

Assure the good connections of post and connectors and low connection resistance;

Combination of suppleness and rigidity for more flexible connections;

Monitor hole designed;

- Flexible and convenient installation, slinky outside looking

Shockproof blocking assembling

Satisfy customer's individual requirements and provide up to 8-class shockproof

Streamline and dime-light battery outside-looking design.

### 2. Main applications

- Telecom exchange and transmission system
- Mobile communication system

- Power plant and power transformer system
- Navigation aid signaling system
- Solar energy system
- Radio and broadcasting station
- Emergency lighting system
- Other standby, cycling system

### 3. Configuration



Fig. 1-1 Configuration

### 4. Types and Dimensions

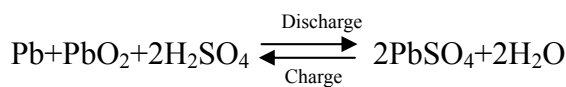
Table 1-1 type specifications

| Cell Type | Rated Voltage (V) | Rated Capacity (Ah) |                |                | Dimensions (mm) |       |        |                | Weight (Kg) |
|-----------|-------------------|---------------------|----------------|----------------|-----------------|-------|--------|----------------|-------------|
|           |                   | C <sub>10</sub>     | C <sub>3</sub> | C <sub>1</sub> | Length          | Width | Height | Overall Height |             |
| Eos-200   | 2                 | 200                 | 150            | 110            | 94.5            | 184.5 | 360.5  | 372            | 13.5        |
| Eos-260   | 2                 | 260                 | 195            | 143            | 109             | 184.5 | 360.5  | 372            | 17          |
| Eos-300   | 2                 | 300                 | 225            | 165            | 123             | 184.5 | 360.5  | 372            | 18.5        |
| Eos-400   | 2                 | 400                 | 300            | 220            | 166             | 184.5 | 360.5  | 372            | 24.5        |
| Eos-500   | 2                 | 500                 | 375            | 275            | 194.5           | 184.5 | 360.5  | 372            | 29.5        |
| Eos-600   | 2                 | 600                 | 450            | 330            | 223             | 184.5 | 360.5  | 372            | 35          |
| Eos-800   | 2                 | 800                 | 600            | 440            | 154             | 229   | 555    | 566            | 52          |
| Eos-1000  | 2                 | 1000                | 750            | 550            | 186             | 229   | 555    | 566            | 62          |
| Eos-1200  | 2                 | 1200                | 900            | 660            | 225             | 229   | 555    | 566            | 75          |
| Eos-1500  | 2                 | 1500                | 1125           | 825            | 265.5           | 229   | 555    | 566            | 92          |

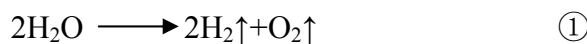
|           |   |      |      |      |       |     |       |     |     |
|-----------|---|------|------|------|-------|-----|-------|-----|-----|
| Eos-2000  | 2 | 2000 | 1500 | 1100 | 349   | 233 | 555   | 566 | 121 |
| Eos-800A  | 2 | 800  | 600  | 440  | 280   | 186 | 360.5 | 372 | 47  |
| Eos-1000A | 2 | 1000 | 750  | 550  | 339   | 190 | 360.5 | 372 | 58  |
| Eos-1500A | 2 | 1500 | 1125 | 825  | 496   | 186 | 362   | 374 | 87  |
| Eos-2000A | 2 | 2000 | 1500 | 1100 | 328.5 | 363 | 362   | 374 | 115 |
| Eos-3000  | 2 | 3000 | 2250 | 1650 | 496   | 363 | 362   | 374 | 175 |

### 5. Working Principal

The chemical reaction taking place in lead acid battery is as follows:



Following by-reaction ① takes place in ordinary lead acid battery:



This by-reaction makes water loss gradually and pure water need to be added regularly to keep the battery operate normally.

Eos battery adopts a design of barren-liquor and utilizes AGM (micro porous glass fiber) separator. Thus there is a path existing between the positive and the negative. Also special alloy grid is chosen to increase vent hydrogen over-potential gassing on the negative plate, which prevents generation of hydrogen. Otherwise, the oxygen generated from positive diffuses through separator to the negative and the oxygen gas reacts quickly and is recombined into water. The reactions are as follows::

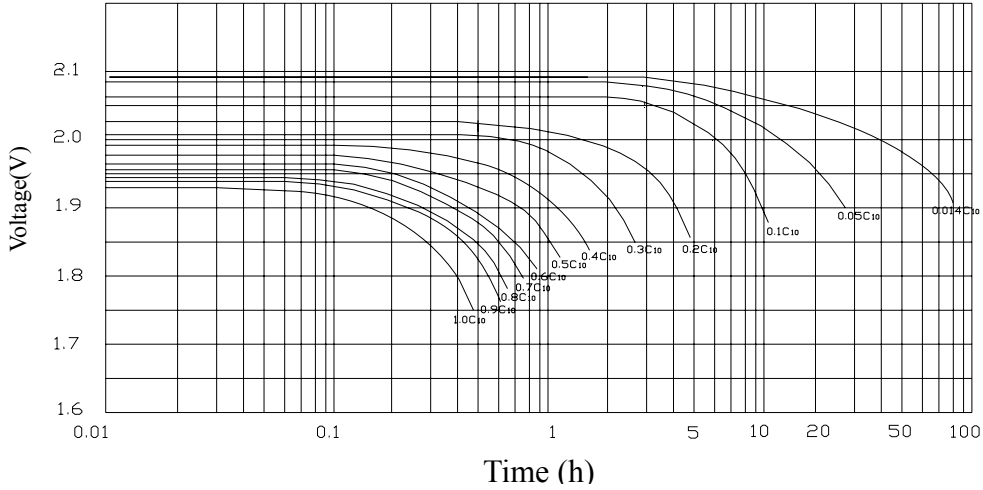


So it is possible to build EOS battery in sealed structure.

## Chapter Two Technical characteristic

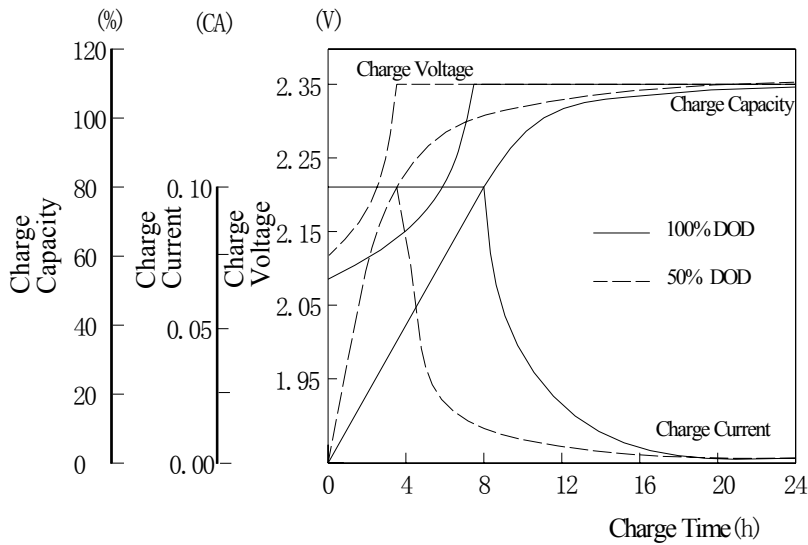
### 1. Discharge Curve

Fig. 2-1 Discharge Performance Curves at Different Discharge Rates (25°C)



### 2. Charge Curve

Fig.2-2 Recharge characteristics of Eos battery with current of 0.1C<sub>10</sub>A and limit voltage of 2.35V/cell (25°C). The 100% DOD battery can be recharged 105% of capacity after charging for 24 hours.



### 3. Discharge characteristic

Table2-1 Constant current discharge characteristic (A, 25°C)

| Eos-200 | 5min  | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| 1.60V   | 333.3 | 279.1 | 206.7 | 130.7 | 77.0  | 56.5  | 38.3  | 33.1  | 26.4  | 21.9   | 9.8    |
| 1.65V   | 307.9 | 260.2 | 198.0 | 123.9 | 75.2  | 55.1  | 37.4  | 32.6  | 26.0  | 21.7   | 9.7    |
| 1.70V   | 287.8 | 244.0 | 182.2 | 118.4 | 72.5  | 53.5  | 37.1  | 32.2  | 25.5  | 21.3   | 9.6    |
| 1.75V   | 274.3 | 231.0 | 169.3 | 112.9 | 69.9  | 51.9  | 36.0  | 31.7  | 25.2  | 21.0   | 9.5    |
| 1.80V   | 263.8 | 217.8 | 158.4 | 105.7 | 66.9  | 50.3  | 35.2  | 30.9  | 24.8  | 20.6   | 9.3    |
| 1.83V   | 245.4 | 204.5 | 150.8 | 99.0  | 63.9  | 48.7  | 34.4  | 30.3  | 24.3  | 20.1   | 9.1    |
| 1.85V   | 233.6 | 193.1 | 141.2 | 95.4  | 60.4  | 47.7  | 34.0  | 29.9  | 24.0  | 20.0   | 9.0    |
| 1.88V   | 217.2 | 176.1 | 132.7 | 91.4  | 59.1  | 46.7  | 33.7  | 29.5  | 23.8  | 19.8   | 9.0    |
| 1.90V   | 200.9 | 163.3 | 121.2 | 84.7  | 56.6  | 44.7  | 32.7  | 28.8  | 23.1  | 19.3   | 8.8    |
| 1.94V   | 180.7 | 145.5 | 107.3 | 75.2  | 51.2  | 41.1  | 30.3  | 26.7  | 21.6  | 18.2   | 8.5    |
| Eos-260 | 5min  | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
| 1.60V   | 433.3 | 362.9 | 268.7 | 169.9 | 100.1 | 73.5  | 49.8  | 43.0  | 34.3  | 28.5   | 12.7   |
| 1.65V   | 400.3 | 338.3 | 257.4 | 161.1 | 97.8  | 71.7  | 48.6  | 42.4  | 33.8  | 28.2   | 12.6   |
| 1.70V   | 374.2 | 317.2 | 236.8 | 153.9 | 94.2  | 69.6  | 48.2  | 41.9  | 33.2  | 27.7   | 12.5   |
| 1.75V   | 356.6 | 300.3 | 220.1 | 146.7 | 90.9  | 67.4  | 46.8  | 41.2  | 32.8  | 27.3   | 12.4   |
| 1.80V   | 343.0 | 283.1 | 205.9 | 137.5 | 87.0  | 65.4  | 45.8  | 40.2  | 32.2  | 26.7   | 12.1   |
| 1.83V   | 319.0 | 265.8 | 196.1 | 128.7 | 83.1  | 63.3  | 44.7  | 39.4  | 31.6  | 26.2   | 11.9   |
| 1.85V   | 303.7 | 251.1 | 183.6 | 124.1 | 78.5  | 62.0  | 44.2  | 38.9  | 31.2  | 26.0   | 11.8   |
| 1.88V   | 282.3 | 228.9 | 172.5 | 118.8 | 76.8  | 60.7  | 43.8  | 38.3  | 30.9  | 25.8   | 11.7   |
| 1.90V   | 261.1 | 212.3 | 157.5 | 110.2 | 73.6  | 58.2  | 42.6  | 37.4  | 30.1  | 25.1   | 11.5   |
| 1.94V   | 234.9 | 189.1 | 139.4 | 97.8  | 66.5  | 53.5  | 39.4  | 34.7  | 28.1  | 23.7   | 11.0   |
| Eos-300 | 5min  | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
| 1.60V   | 500.0 | 418.7 | 310.1 | 196.0 | 115.5 | 84.8  | 57.5  | 49.6  | 39.6  | 32.8   | 14.6   |
| 1.65V   | 461.9 | 390.3 | 297.0 | 185.9 | 112.9 | 82.7  | 56.1  | 48.9  | 39.0  | 32.5   | 14.5   |
| 1.70V   | 431.8 | 366.0 | 273.2 | 177.6 | 108.7 | 80.3  | 55.6  | 48.3  | 38.3  | 32.0   | 14.4   |
| 1.75V   | 411.4 | 346.5 | 253.9 | 169.3 | 104.9 | 77.8  | 54.1  | 47.5  | 37.8  | 31.5   | 14.3   |
| 1.80V   | 395.7 | 326.7 | 237.6 | 158.6 | 100.4 | 75.4  | 52.8  | 46.3  | 37.1  | 30.8   | 14.0   |
| 1.83V   | 368.1 | 306.7 | 226.2 | 148.5 | 95.9  | 73.0  | 51.6  | 45.5  | 36.5  | 30.2   | 13.7   |
| 1.85V   | 350.4 | 289.7 | 211.9 | 143.2 | 90.6  | 71.6  | 51.0  | 44.8  | 36.1  | 30.0   | 13.6   |
| 1.88V   | 325.7 | 264.2 | 199.0 | 137.1 | 88.6  | 70.1  | 50.5  | 44.2  | 35.6  | 29.8   | 13.5   |
| 1.90V   | 301.3 | 245.0 | 181.8 | 127.1 | 84.9  | 67.1  | 49.1  | 43.2  | 34.7  | 29.0   | 13.2   |
| 1.94V   | 271.0 | 218.2 | 160.9 | 112.9 | 76.7  | 61.7  | 45.5  | 40.1  | 32.4  | 27.3   | 12.7   |
| Eos-400 | 5min  | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
| 1.60V   | 666.6 | 558.3 | 413.4 | 261.4 | 154.0 | 113.0 | 76.7  | 66.1  | 52.7  | 43.8   | 19.5   |
| 1.65V   | 615.9 | 520.5 | 396.0 | 247.9 | 150.5 | 110.2 | 74.8  | 65.3  | 52.0  | 43.3   | 19.4   |
| 1.70V   | 575.7 | 488.0 | 364.3 | 236.8 | 144.9 | 107.1 | 74.1  | 64.4  | 51.1  | 42.7   | 19.3   |
| 1.75V   | 548.6 | 462.0 | 338.6 | 225.7 | 139.9 | 103.8 | 72.1  | 63.4  | 50.5  | 42.1   | 19.0   |
| 1.80V   | 527.6 | 435.6 | 316.8 | 211.5 | 133.8 | 100.6 | 70.4  | 61.8  | 49.5  | 41.1   | 18.7   |
| 1.83V   | 490.8 | 409.0 | 301.6 | 198.0 | 127.8 | 97.3  | 68.7  | 60.7  | 48.6  | 40.2   | 18.3   |
| 1.85V   | 467.2 | 386.3 | 282.5 | 190.9 | 120.8 | 95.4  | 68.0  | 59.8  | 48.1  | 40.0   | 18.1   |



|                 |             |              |              |              |              |              |              |              |              |               |               |
|-----------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| 1.88V           | 434.3       | 352.2        | 265.3        | 182.8        | 118.1        | 93.5         | 67.3         | 58.9         | 47.5         | 39.7          | 17.9          |
| 1.90V           | 401.8       | 326.6        | 242.4        | 169.5        | 113.3        | 89.5         | 65.5         | 57.6         | 46.3         | 38.6          | 17.7          |
| 1.94V           | 361.3       | 290.9        | 214.5        | 150.5        | 102.3        | 82.3         | 60.7         | 53.5         | 43.2         | 36.4          | 17.0          |
| <b>Eos-500</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 833.3       | 697.9        | 516.8        | 326.7        | 192.6        | 141.3        | 95.8         | 82.7         | 65.9         | 54.7          | 24.4          |
| 1.65V           | 769.8       | 650.6        | 495.0        | 309.9        | 188.1        | 137.8        | 93.5         | 81.6         | 65.0         | 54.2          | 24.2          |
| 1.70V           | 719.6       | 610.0        | 455.4        | 296.0        | 181.2        | 133.8        | 92.7         | 80.5         | 63.9         | 53.4          | 24.1          |
| 1.75V           | 685.7       | 577.5        | 423.2        | 282.2        | 174.8        | 129.7        | 90.1         | 79.2         | 63.1         | 52.6          | 23.8          |
| 1.80V           | 659.6       | 544.5        | 396.0        | 264.3        | 167.3        | 125.7        | 88.0         | 77.2         | 61.9         | 51.4          | 23.3          |
| 1.83V           | 613.5       | 511.2        | 377.0        | 247.5        | 159.8        | 121.7        | 85.9         | 75.8         | 60.8         | 50.3          | 22.9          |
| 1.85V           | 584.0       | 482.8        | 353.1        | 238.6        | 151.0        | 119.3        | 85.0         | 74.7         | 60.1         | 50.0          | 22.6          |
| 1.88V           | 542.9       | 440.3        | 331.7        | 228.5        | 147.7        | 116.8        | 84.2         | 73.7         | 59.4         | 49.6          | 22.4          |
| 1.90V           | 502.2       | 408.3        | 302.9        | 211.9        | 141.6        | 111.9        | 81.9         | 72.0         | 57.8         | 48.3          | 22.1          |
| 1.94V           | 451.6       | 363.7        | 268.1        | 188.1        | 127.9        | 102.9        | 75.8         | 66.8         | 54.1         | 45.5          | 21.2          |
| <b>Eos-600</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 999.9       | 837.4        | 620.1        | 392.0        | 231.1        | 169.5        | 115.0        | 99.2         | 79.1         | 65.7          | 29.3          |
| 1.65V           | 923.8       | 780.7        | 594.0        | 371.8        | 225.7        | 165.4        | 112.1        | 97.9         | 78.1         | 65.0          | 29.1          |
| 1.70V           | 863.5       | 732.1        | 546.5        | 355.2        | 217.4        | 160.6        | 111.2        | 96.6         | 76.6         | 64.0          | 28.9          |
| 1.75V           | 822.8       | 693.0        | 507.9        | 338.6        | 209.8        | 155.6        | 108.1        | 95.0         | 75.7         | 63.1          | 28.5          |
| 1.80V           | 791.5       | 653.4        | 475.2        | 317.2        | 200.8        | 150.9        | 105.6        | 92.7         | 74.3         | 61.7          | 28.0          |
| 1.83V           | 736.2       | 613.5        | 452.4        | 297.0        | 191.7        | 146.0        | 103.1        | 91.0         | 72.9         | 60.4          | 27.4          |
| 1.85V           | 700.8       | 579.4        | 423.7        | 286.3        | 181.2        | 143.2        | 102.0        | 89.7         | 72.1         | 60.0          | 27.1          |
| 1.88V           | 651.5       | 528.3        | 398.0        | 274.2        | 177.2        | 140.2        | 101.0        | 88.4         | 71.3         | 59.5          | 26.9          |
| 1.90V           | 602.6       | 489.9        | 363.5        | 254.2        | 169.9        | 134.2        | 98.2         | 86.4         | 69.4         | 58.0          | 26.5          |
| 1.94V           | 542.0       | 436.4        | 321.8        | 225.7        | 153.5        | 123.4        | 91.0         | 80.2         | 64.9         | 54.6          | 25.5          |
| <b>Eos-800</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1158.3      | 974.6        | 792.0        | 521.9        | 320.8        | 235.5        | 154.0        | 132.7        | 103.9        | 86.0          | 39.9          |
| 1.65V           | 1086.2      | 917.4        | 722.3        | 492.6        | 311.7        | 229.2        | 152.1        | 131.1        | 103.0        | 85.5          | 39.3          |
| 1.70V           | 1020.8      | 868.1        | 660.5        | 468.1        | 301.0        | 218.9        | 148.3        | 127.9        | 101.5        | 84.2          | 39.1          |
| 1.75V           | 963.0       | 817.1        | 609.0        | 441.9        | 289.9        | 213.8        | 145.7        | 126.0        | 100.1        | 83.5          | 38.8          |
| 1.80V           | 909.7       | 762.0        | 570.2        | 419.8        | 281.2        | 209.1        | 142.4        | 123.6        | 98.2         | 82.4          | 38.0          |
| 1.83V           | 842.6       | 701.4        | 532.2        | 396.0        | 269.3        | 202.8        | 140.2        | 122.0        | 97.6         | 82.0          | 38.0          |
| 1.85V           | 781.1       | 648.2        | 501.3        | 370.7        | 253.4        | 191.8        | 133.5        | 116.8        | 94.2         | 79.0          | 36.9          |
| 1.88V           | 717.1       | 586.3        | 464.1        | 336.6        | 235.6        | 180.8        | 127.2        | 111.3        | 90.8         | 76.0          | 35.8          |
| 1.90V           | 639.7       | 511.8        | 416.6        | 306.5        | 211.9        | 171.3        | 120.9        | 106.0        | 85.4         | 72.0          | 34.4          |
| 1.94V           | 575.8       | 465.2        | 382.5        | 275.6        | 189.1        | 146.9        | 106.3        | 93.7         | 76.6         | 65.3          | 30.6          |
| <b>Eos-1000</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1447.9      | 1218.3       | 990.0        | 652.4        | 401.0        | 294.4        | 192.5        | 165.8        | 129.8        | 107.5         | 49.8          |
| 1.65V           | 1357.7      | 1146.7       | 902.9        | 615.8        | 389.6        | 286.4        | 190.1        | 163.8        | 128.7        | 106.9         | 49.1          |
| 1.70V           | 1276.0      | 1085.2       | 825.7        | 585.1        | 376.2        | 273.6        | 185.3        | 159.9        | 126.8        | 105.2         | 48.9          |
| 1.75V           | 1203.7      | 1021.4       | 761.3        | 552.4        | 362.3        | 267.3        | 182.2        | 157.5        | 125.1        | 104.3         | 48.5          |
| 1.80V           | 1137.2      | 952.5        | 712.8        | 524.7        | 351.5        | 261.4        | 178.0        | 154.4        | 122.8        | 103.0         | 47.4          |
| 1.83V           | 1053.2      | 876.8        | 665.3        | 495.0        | 336.6        | 253.4        | 175.2        | 152.5        | 122.0        | 102.5         | 47.4          |
| 1.85V           | 976.3       | 810.2        | 626.7        | 463.3        | 316.8        | 239.7        | 166.8        | 146.0        | 117.8        | 98.8          | 46.1          |

|                 |             |              |              |              |              |              |              |              |              |               |               |
|-----------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| 1.88V           | 896.4       | 732.9        | 580.1        | 420.8        | 294.5        | 226.1        | 159.0        | 139.1        | 113.5        | 95.0          | 44.7          |
| 1.90V           | 799.6       | 639.7        | 520.7        | 383.1        | 264.8        | 214.2        | 151.1        | 132.5        | 106.8        | 90.0          | 43.0          |
| 1.94V           | 719.8       | 581.5        | 478.2        | 344.5        | 236.4        | 183.6        | 132.9        | 117.2        | 95.8         | 81.7          | 38.3          |
| <b>Eos-1200</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1737.5      | 1461.9       | 1188.0       | 782.9        | 481.1        | 353.2        | 230.9        | 199.0        | 155.8        | 129.0         | 59.8          |
| 1.65V           | 1629.3      | 1376.0       | 1083.5       | 738.9        | 467.5        | 343.7        | 228.1        | 196.6        | 154.4        | 128.3         | 58.9          |
| 1.70V           | 1531.2      | 1302.2       | 990.8        | 702.1        | 451.4        | 328.3        | 222.4        | 191.9        | 152.2        | 126.3         | 58.7          |
| 1.75V           | 1444.4      | 1225.7       | 913.6        | 662.9        | 434.8        | 320.8        | 218.6        | 189.0        | 150.1        | 125.2         | 58.2          |
| 1.80V           | 1364.6      | 1143.0       | 855.4        | 629.6        | 421.7        | 313.6        | 213.6        | 185.3        | 147.3        | 123.6         | 56.9          |
| 1.83V           | 1263.8      | 1052.1       | 798.3        | 594.0        | 403.9        | 304.1        | 210.3        | 183.0        | 146.4        | 123.0         | 56.9          |
| 1.85V           | 1171.6      | 972.3        | 752.0        | 556.0        | 380.2        | 287.7        | 200.2        | 175.2        | 141.4        | 118.5         | 55.3          |
| 1.88V           | 1075.7      | 879.5        | 696.2        | 504.9        | 353.4        | 271.3        | 190.8        | 166.9        | 136.2        | 114.0         | 53.7          |
| 1.90V           | 959.5       | 767.6        | 624.9        | 459.8        | 317.8        | 257.0        | 181.3        | 159.0        | 128.2        | 108.0         | 51.6          |
| 1.94V           | 863.7       | 697.8        | 573.8        | 413.4        | 283.6        | 220.3        | 159.5        | 140.6        | 114.9        | 98.0          | 45.9          |
| <b>Eos-1500</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 2171.8      | 1827.4       | 1485.0       | 978.6        | 601.4        | 441.5        | 288.7        | 248.7        | 194.7        | 161.3         | 74.7          |
| 1.65V           | 2036.6      | 1720.1       | 1354.3       | 923.7        | 584.3        | 429.7        | 285.1        | 245.8        | 193.1        | 160.4         | 73.7          |
| 1.70V           | 1914.0      | 1627.7       | 1238.5       | 877.6        | 564.3        | 410.4        | 278.0        | 239.8        | 190.3        | 157.9         | 73.4          |
| 1.75V           | 1805.5      | 1532.1       | 1142.0       | 828.6        | 543.5        | 401.0        | 273.2        | 236.3        | 187.7        | 156.5         | 72.7          |
| 1.80V           | 1705.7      | 1428.8       | 1069.2       | 787.1        | 527.2        | 392.0        | 267.0        | 231.7        | 184.1        | 154.4         | 71.2          |
| 1.83V           | 1579.8      | 1315.2       | 997.9        | 742.5        | 504.9        | 380.2        | 262.8        | 228.7        | 183.0        | 153.7         | 71.2          |
| 1.85V           | 1464.5      | 1215.4       | 940.0        | 695.0        | 475.2        | 359.6        | 250.2        | 219.0        | 176.7        | 148.1         | 69.1          |
| 1.88V           | 1344.6      | 1099.3       | 870.2        | 631.1        | 441.8        | 339.1        | 238.5        | 208.6        | 170.2        | 142.6         | 67.1          |
| 1.90V           | 1199.4      | 959.5        | 781.1        | 574.7        | 397.2        | 321.3        | 226.6        | 198.7        | 160.2        | 135.0         | 64.5          |
| 1.94V           | 1079.7      | 872.2        | 717.3        | 516.8        | 354.5        | 275.3        | 199.4        | 175.7        | 143.6        | 122.5         | 57.4          |
| <b>Eos-2000</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 2895.8      | 2436.6       | 1980.0       | 1304.8       | 801.9        | 588.7        | 384.9        | 331.7        | 259.6        | 215.0         | 99.7          |
| 1.65V           | 2715.4      | 2293.4       | 1805.8       | 1231.6       | 779.1        | 572.9        | 380.2        | 327.7        | 257.4        | 213.8         | 98.2          |
| 1.70V           | 2552.0      | 2170.3       | 1651.3       | 1170.2       | 752.4        | 547.1        | 370.7        | 319.8        | 253.7        | 210.5         | 97.8          |
| 1.75V           | 2407.4      | 2042.8       | 1522.6       | 1104.8       | 724.7        | 534.6        | 364.3        | 315.1        | 250.2        | 208.7         | 96.9          |
| 1.80V           | 2274.3      | 1905.1       | 1425.6       | 1049.4       | 702.9        | 522.7        | 356.0        | 308.9        | 245.5        | 205.9         | 94.9          |
| 1.83V           | 2106.4      | 1753.6       | 1330.6       | 990.0        | 673.2        | 506.9        | 350.5        | 304.9        | 244.0        | 204.9         | 94.9          |
| 1.85V           | 1952.6      | 1620.5       | 1253.3       | 926.6        | 633.6        | 479.5        | 333.6        | 292.1        | 235.6        | 197.5         | 92.2          |
| 1.88V           | 1792.8      | 1465.8       | 1160.3       | 841.5        | 589.1        | 452.1        | 318.0        | 278.2        | 227.0        | 190.1         | 89.4          |
| 1.90V           | 1599.2      | 1279.4       | 1041.5       | 766.3        | 529.7        | 428.3        | 302.1        | 265.0        | 213.6        | 180.0         | 86.0          |
| 1.94V           | 1439.5      | 1163.0       | 956.3        | 689.0        | 472.7        | 367.1        | 265.8        | 234.3        | 191.5        | 163.4         | 76.6          |
| <b>Eos-800A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1160.6      | 976.5        | 793.6        | 522.9        | 321.4        | 236.0        | 154.3        | 133.0        | 104.1        | 86.2          | 40.0          |
| 1.65V           | 1088.4      | 919.2        | 723.7        | 493.6        | 312.3        | 229.7        | 152.4        | 131.4        | 103.2        | 85.7          | 39.4          |
| 1.70V           | 1022.8      | 869.8        | 661.8        | 469.0        | 301.6        | 219.3        | 148.6        | 128.2        | 101.7        | 84.4          | 39.2          |
| 1.75V           | 964.9       | 818.7        | 610.2        | 442.8        | 290.5        | 214.2        | 146.0        | 126.3        | 100.3        | 83.7          | 38.9          |
| 1.80V           | 911.5       | 763.5        | 571.3        | 420.6        | 281.8        | 209.5        | 142.7        | 123.8        | 98.4         | 82.6          | 38.1          |
| 1.83V           | 844.3       | 702.8        | 533.3        | 396.8        | 269.8        | 203.2        | 140.5        | 122.2        | 97.8         | 82.2          | 38.1          |
| 1.85V           | 782.7       | 649.5        | 502.3        | 371.4        | 253.9        | 192.2        | 133.8        | 117.0        | 94.4         | 79.2          | 37.0          |

|                  |             |              |              |              |              |              |              |              |              |               |               |
|------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| 1.88V            | 718.5       | 587.5        | 465.0        | 337.3        | 236.1        | 181.2        | 127.5        | 111.5        | 91.0         | 76.2          | 35.9          |
| 1.90V            | 641.0       | 512.8        | 417.4        | 307.1        | 212.3        | 171.6        | 121.1        | 106.2        | 85.6         | 72.1          | 34.5          |
| 1.94V            | 577.0       | 466.1        | 383.3        | 276.2        | 189.5        | 147.2        | 106.5        | 93.9         | 76.8         | 65.4          | 30.7          |
| <b>Eos-1000A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 1450.8      | 1220.7       | 992.0        | 653.7        | 401.8        | 295.0        | 192.9        | 166.1        | 130.1        | 107.7         | 49.9          |
| 1.65V            | 1360.4      | 1149.0       | 904.7        | 617.0        | 390.4        | 287.0        | 190.5        | 164.1        | 129.0        | 107.1         | 49.2          |
| 1.70V            | 1278.6      | 1087.4       | 827.4        | 586.3        | 377.0        | 274.1        | 185.7        | 160.2        | 127.1        | 105.4         | 49.0          |
| 1.75V            | 1206.1      | 1023.4       | 762.8        | 553.5        | 363.0        | 267.8        | 182.6        | 157.8        | 125.4        | 104.5         | 48.6          |
| 1.80V            | 1139.5      | 954.4        | 714.2        | 525.7        | 352.2        | 261.9        | 178.4        | 154.7        | 123.0        | 103.2         | 47.5          |
| 1.83V            | 1055.3      | 878.6        | 666.6        | 496.0        | 337.3        | 253.9        | 175.6        | 152.8        | 122.2        | 102.7         | 47.5          |
| 1.85V            | 978.3       | 811.8        | 628.0        | 464.2        | 317.4        | 240.2        | 167.1        | 146.3        | 118.0        | 99.0          | 46.2          |
| 1.88V            | 898.2       | 734.4        | 581.3        | 421.6        | 295.1        | 226.6        | 159.3        | 139.4        | 113.7        | 95.2          | 44.8          |
| 1.90V            | 801.2       | 641.0        | 521.7        | 383.9        | 265.3        | 214.6        | 151.4        | 132.8        | 107.0        | 90.2          | 43.1          |
| 1.94V            | 721.2       | 582.7        | 479.2        | 345.2        | 236.9        | 184.0        | 133.2        | 117.4        | 96.0         | 81.9          | 38.4          |
| <b>Eos-1500A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 2177.3      | 1832.0       | 1488.7       | 981.0        | 603.0        | 442.7        | 289.5        | 249.3        | 195.2        | 161.6         | 74.9          |
| 1.65V            | 2041.6      | 1724.4       | 1357.7       | 926.0        | 585.9        | 430.7        | 285.9        | 246.3        | 193.6        | 160.7         | 73.8          |
| 1.70V            | 1918.9      | 1631.9       | 1241.7       | 879.9        | 565.8        | 411.4        | 278.7        | 240.4        | 190.7        | 158.2         | 73.5          |
| 1.75V            | 1810.1      | 1535.9       | 1144.8       | 830.7        | 544.8        | 401.9        | 274.0        | 236.8        | 188.2        | 156.8         | 72.9          |
| 1.80V            | 1710.1      | 1432.3       | 1071.8       | 788.9        | 528.6        | 393.0        | 267.7        | 232.2        | 184.6        | 154.9         | 71.3          |
| 1.83V            | 1583.7      | 1318.6       | 1000.4       | 744.4        | 506.2        | 381.0        | 263.5        | 229.3        | 183.4        | 154.1         | 71.2          |
| 1.85V            | 1468.2      | 1218.3       | 942.5        | 696.6        | 476.3        | 360.5        | 250.8        | 219.6        | 177.1        | 148.6         | 69.3          |
| 1.88V            | 1348.0      | 1102.2       | 872.4        | 632.7        | 442.9        | 340.1        | 239.1        | 209.2        | 170.6        | 142.9         | 67.2          |
| 1.90V            | 1202.4      | 962.0        | 782.9        | 576.1        | 398.1        | 322.1        | 227.2        | 199.3        | 160.6        | 135.4         | 64.7          |
| 1.94V            | 1082.3      | 874.5        | 719.2        | 518.1        | 355.5        | 276.1        | 199.9        | 176.2        | 144.1        | 122.9         | 57.6          |
| <b>Eos-2000A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 2903.1      | 2442.6       | 1985.0       | 1308.1       | 804.0        | 590.3        | 386.0        | 332.4        | 260.3        | 215.5         | 99.8          |
| 1.65V            | 2722.2      | 2299.1       | 1810.3       | 1234.6       | 781.2        | 574.3        | 381.2        | 328.4        | 258.1        | 214.3         | 98.4          |
| 1.70V            | 2558.5      | 2175.9       | 1655.6       | 1173.2       | 754.4        | 548.5        | 371.6        | 320.6        | 254.3        | 210.9         | 98.0          |
| 1.75V            | 2413.4      | 2047.8       | 1526.4       | 1107.6       | 726.4        | 535.9        | 365.4        | 315.8        | 250.9        | 209.1         | 97.2          |
| 1.80V            | 2280.1      | 1909.8       | 1429.1       | 1051.9       | 704.8        | 524.1        | 357.0        | 309.6        | 246.1        | 206.5         | 95.0          |
| 1.83V            | 2111.7      | 1758.1       | 1333.9       | 992.5        | 674.9        | 508.1        | 351.4        | 305.8        | 244.5        | 205.5         | 94.9          |
| 1.85V            | 1957.6      | 1624.4       | 1256.6       | 928.9        | 635.1        | 480.6        | 334.4        | 292.7        | 236.1        | 198.1         | 92.4          |
| 1.88V            | 1797.3      | 1469.5       | 1163.2       | 843.6        | 590.5        | 453.4        | 318.8        | 278.9        | 227.5        | 190.5         | 89.6          |
| 1.90V            | 1603.2      | 1282.6       | 1043.9       | 768.2        | 530.9        | 429.4        | 303.0        | 265.7        | 214.1        | 180.5         | 86.2          |
| 1.94V            | 1443.1      | 1166.0       | 958.9        | 690.7        | 474.0        | 368.2        | 266.5        | 234.9        | 192.1        | 163.9         | 76.8          |
| <b>Eos-3000</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 4352.4      | 3662.1       | 2976.0       | 1961.1       | 1205.4       | 885.0        | 578.7        | 498.3        | 390.3        | 323.1         | 149.7         |
| 1.65V            | 4081.2      | 3447.0       | 2714.1       | 1851.0       | 1171.2       | 861.0        | 571.5        | 492.3        | 387.0        | 321.3         | 147.6         |
| 1.70V            | 3835.8      | 3262.2       | 2482.2       | 1758.9       | 1131.0       | 822.3        | 557.1        | 480.6        | 381.3        | 316.2         | 147.0         |
| 1.75V            | 3618.3      | 3070.2       | 2288.4       | 1660.5       | 1089.0       | 803.4        | 547.8        | 473.4        | 376.2        | 313.5         | 145.8         |
| 1.80V            | 3418.5      | 2863.2       | 2142.6       | 1577.1       | 1056.6       | 785.7        | 535.2        | 464.1        | 369.0        | 309.6         | 142.5         |
| 1.83V            | 3165.9      | 2635.8       | 1999.8       | 1488.0       | 1011.9       | 761.7        | 526.8        | 458.4        | 366.6        | 308.1         | 142.3         |
| 1.85V            | 2934.9      | 2435.4       | 1884.0       | 1392.6       | 952.2        | 720.6        | 501.3        | 438.9        | 354.0        | 297.0         | 138.6         |

|       |        |        |        |        |       |       |       |       |       |       |       |
|-------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| 1.88V | 2694.6 | 2203.2 | 1743.9 | 1264.8 | 885.3 | 679.8 | 477.9 | 418.2 | 341.1 | 285.6 | 134.4 |
| 1.90V | 2403.6 | 1923.0 | 1565.1 | 1151.7 | 795.9 | 643.8 | 454.2 | 398.4 | 321.0 | 270.6 | 129.3 |
| 1.94V | 2163.6 | 1748.1 | 1437.6 | 1035.6 | 710.7 | 552.0 | 399.6 | 352.2 | 288.0 | 245.7 | 115.2 |

Table2-2 Constant power discharge characteristic (Watts, 25°C)

| Eos-200 | 5min   | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
|---------|--------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| 1.60V   | 566.6  | 474.5 | 377.9 | 269.3 | 173.7 | 128.7 | 85.0  | 72.6  | 56.7  | 46.3   | 21.2   |
| 1.65V   | 538.9  | 455.4 | 357.4 | 248.8 | 159.4 | 120.8 | 82.0  | 70.3  | 54.6  | 45.2   | 20.7   |
| 1.70V   | 518.1  | 439.2 | 348.5 | 236.9 | 154.8 | 116.5 | 80.2  | 68.9  | 53.5  | 43.9   | 20.1   |
| 1.75V   | 501.9  | 422.7 | 336.6 | 227.7 | 149.3 | 112.2 | 78.2  | 67.3  | 51.5  | 43.2   | 19.8   |
| 1.80V   | 488.1  | 402.9 | 324.7 | 222.4 | 146.5 | 108.2 | 76.0  | 65.3  | 50.2  | 42.6   | 19.5   |
| 1.83V   | 461.3  | 384.5 | 306.2 | 214.5 | 140.6 | 105.6 | 74.4  | 63.4  | 49.2  | 41.7   | 19.1   |
| 1.85V   | 443.9  | 367.0 | 288.8 | 202.3 | 134.6 | 102.5 | 72.5  | 61.9  | 48.5  | 40.9   | 18.8   |
| 1.88V   | 419.1  | 339.9 | 268.5 | 190.1 | 125.1 | 99.0  | 70.1  | 59.7  | 47.2  | 39.9   | 18.3   |
| 1.90V   | 391.7  | 318.5 | 243.5 | 174.2 | 116.8 | 95.0  | 67.7  | 57.8  | 45.4  | 38.0   | 18.0   |
| 1.94V   | 354.1  | 285.1 | 218.2 | 154.4 | 107.9 | 88.3  | 64.2  | 55.4  | 43.6  | 36.3   | 17.5   |
| Eos-260 | 5min   | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
| 1.60V   | 736.6  | 616.9 | 491.2 | 350.1 | 225.9 | 167.3 | 110.5 | 94.4  | 73.8  | 60.2   | 27.6   |
| 1.65V   | 700.6  | 592.0 | 464.6 | 323.5 | 207.2 | 157.0 | 106.6 | 91.4  | 71.0  | 58.8   | 26.9   |
| 1.70V   | 673.5  | 571.0 | 453.0 | 308.0 | 201.2 | 151.4 | 104.2 | 89.6  | 69.5  | 57.1   | 26.2   |
| 1.75V   | 652.5  | 549.5 | 437.6 | 296.0 | 194.1 | 145.9 | 101.7 | 87.5  | 66.9  | 56.2   | 25.8   |
| 1.80V   | 634.5  | 523.8 | 422.1 | 289.1 | 190.5 | 140.7 | 98.8  | 84.9  | 65.2  | 55.3   | 25.4   |
| 1.83V   | 599.7  | 499.8 | 398.1 | 278.9 | 182.8 | 137.3 | 96.8  | 82.4  | 63.9  | 54.3   | 24.9   |
| 1.85V   | 577.0  | 477.0 | 375.4 | 263.0 | 175.0 | 133.2 | 94.2  | 80.4  | 63.1  | 53.2   | 24.4   |
| 1.88V   | 544.8  | 441.9 | 349.0 | 247.1 | 162.7 | 128.7 | 91.1  | 77.6  | 61.3  | 51.9   | 23.8   |
| 1.90V   | 509.2  | 414.0 | 316.6 | 226.5 | 151.9 | 123.6 | 88.0  | 75.2  | 59.0  | 49.3   | 23.4   |
| 1.94V   | 460.3  | 370.7 | 283.7 | 200.8 | 140.3 | 114.8 | 83.4  | 72.1  | 56.6  | 47.2   | 22.7   |
| Eos-300 | 5min   | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
| 1.60V   | 849.9  | 711.8 | 566.8 | 403.9 | 260.6 | 193.1 | 127.5 | 108.9 | 85.1  | 69.5   | 31.9   |
| 1.65V   | 808.3  | 683.1 | 536.1 | 373.2 | 239.1 | 181.2 | 123.1 | 105.4 | 82.0  | 67.8   | 31.1   |
| 1.70V   | 777.2  | 658.8 | 522.7 | 355.4 | 232.2 | 174.7 | 120.3 | 103.4 | 80.2  | 65.8   | 30.2   |
| 1.75V   | 752.9  | 634.1 | 504.9 | 341.6 | 223.9 | 168.3 | 117.3 | 101.0 | 77.2  | 64.8   | 29.7   |
| 1.80V   | 732.1  | 604.4 | 487.1 | 333.6 | 219.8 | 162.4 | 114.0 | 98.0  | 75.2  | 63.9   | 29.3   |
| 1.83V   | 692.0  | 576.7 | 459.4 | 321.8 | 210.9 | 158.4 | 111.7 | 95.0  | 73.8  | 62.6   | 28.7   |
| 1.85V   | 665.8  | 550.4 | 433.1 | 303.4 | 202.0 | 153.7 | 108.7 | 92.8  | 72.8  | 61.4   | 28.1   |
| 1.88V   | 628.7  | 509.9 | 402.7 | 285.1 | 187.7 | 148.5 | 105.1 | 89.5  | 70.8  | 59.9   | 27.5   |
| 1.90V   | 587.6  | 477.7 | 365.3 | 261.4 | 175.2 | 142.6 | 101.6 | 86.7  | 68.1  | 56.9   | 27.0   |
| 1.94V   | 531.1  | 427.7 | 327.3 | 231.7 | 161.9 | 132.5 | 96.2  | 83.2  | 65.3  | 54.5   | 26.2   |
| Eos-400 | 5min   | 15min | 30min | 60min | 2hour | 3hour | 5hour | 6hour | 8hour | 10hour | 24hour |
| 1.60V   | 1133.2 | 949.1 | 755.7 | 538.6 | 347.5 | 257.4 | 170.0 | 145.2 | 113.5 | 92.7   | 42.5   |
| 1.65V   | 1077.8 | 910.8 | 714.8 | 497.6 | 318.8 | 241.6 | 164.1 | 140.6 | 109.3 | 90.4   | 41.5   |
| 1.70V   | 1036.2 | 878.5 | 697.0 | 473.9 | 309.5 | 233.0 | 160.4 | 137.8 | 106.9 | 87.8   | 40.2   |
| 1.75V   | 1003.9 | 845.5 | 673.2 | 455.4 | 298.6 | 224.4 | 156.4 | 134.6 | 103.0 | 86.5   | 39.6   |

|                 |             |              |              |              |              |              |              |              |              |               |               |
|-----------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| 1.80V           | 976.1       | 805.9        | 649.4        | 444.8        | 293.0        | 216.5        | 152.1        | 130.7        | 100.3        | 85.1          | 39.0          |
| 1.83V           | 922.7       | 768.9        | 612.5        | 429.0        | 281.2        | 211.2        | 148.9        | 126.7        | 98.3         | 83.5          | 38.3          |
| 1.85V           | 887.7       | 733.9        | 577.5        | 404.6        | 269.3        | 205.0        | 144.9        | 123.8        | 97.0         | 81.8          | 37.5          |
| 1.88V           | 838.2       | 679.8        | 537.0        | 380.2        | 250.3        | 198.0        | 140.2        | 119.3        | 94.4         | 79.9          | 36.6          |
| 1.90V           | 783.4       | 636.9        | 487.1        | 348.5        | 233.6        | 190.1        | 135.4        | 115.6        | 90.8         | 75.9          | 36.0          |
| 1.94V           | 708.2       | 570.2        | 436.4        | 308.9        | 215.9        | 176.6        | 128.3        | 110.9        | 87.1         | 72.6          | 35.0          |
| <b>Eos-500</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1416.5      | 1186.4       | 944.6        | 673.2        | 434.4        | 321.8        | 212.5        | 181.5        | 141.9        | 115.8         | 53.1          |
| 1.65V           | 1347.2      | 1138.5       | 893.5        | 622.1        | 398.5        | 302.0        | 205.1        | 175.7        | 136.6        | 113.1         | 51.8          |
| 1.70V           | 1295.3      | 1098.1       | 871.2        | 592.4        | 386.9        | 291.2        | 200.5        | 172.3        | 133.7        | 109.7         | 50.3          |
| 1.75V           | 1254.8      | 1056.8       | 841.5        | 569.3        | 373.2        | 280.5        | 195.5        | 168.3        | 128.7        | 108.1         | 49.5          |
| 1.80V           | 1220.2      | 1007.3       | 811.8        | 556.1        | 366.3        | 270.6        | 190.1        | 163.4        | 125.4        | 106.4         | 48.8          |
| 1.83V           | 1153.4      | 961.1        | 765.6        | 536.3        | 351.5        | 264.0        | 186.1        | 158.4        | 122.9        | 104.4         | 47.8          |
| 1.85V           | 1109.6      | 917.4        | 721.9        | 505.7        | 336.6        | 256.2        | 181.2        | 154.7        | 121.3        | 102.3         | 46.9          |
| 1.88V           | 1047.8      | 849.8        | 671.2        | 475.2        | 312.8        | 247.5        | 175.2        | 149.2        | 118.0        | 99.8          | 45.8          |
| 1.90V           | 979.3       | 796.1        | 608.9        | 435.6        | 292.1        | 237.6        | 169.3        | 144.5        | 113.5        | 94.9          | 45.0          |
| 1.94V           | 885.2       | 712.8        | 545.5        | 386.1        | 269.9        | 220.8        | 160.4        | 138.6        | 108.9        | 90.8          | 43.7          |
| <b>Eos-600</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1699.8      | 1423.6       | 1133.6       | 807.8        | 521.2        | 386.1        | 255.0        | 217.8        | 170.2        | 139.0         | 63.7          |
| 1.65V           | 1616.7      | 1366.2       | 1072.2       | 746.5        | 478.2        | 362.3        | 246.1        | 210.9        | 163.9        | 135.7         | 62.2          |
| 1.70V           | 1554.3      | 1317.7       | 1045.4       | 710.8        | 464.3        | 349.5        | 240.6        | 206.7        | 160.4        | 131.7         | 60.3          |
| 1.75V           | 1505.8      | 1268.2       | 1009.8       | 683.1        | 447.9        | 336.6        | 234.6        | 202.0        | 154.4        | 129.7         | 59.4          |
| 1.80V           | 1464.2      | 1208.8       | 974.2        | 667.3        | 439.6        | 324.7        | 228.1        | 196.0        | 150.5        | 127.7         | 58.5          |
| 1.83V           | 1384.0      | 1153.4       | 918.7        | 643.5        | 421.7        | 316.8        | 223.3        | 190.1        | 147.5        | 125.2         | 57.4          |
| 1.85V           | 1331.6      | 1100.9       | 866.3        | 606.9        | 403.9        | 307.5        | 217.4        | 185.6        | 145.5        | 122.8         | 56.3          |
| 1.88V           | 1257.3      | 1019.7       | 805.5        | 570.2        | 375.4        | 297.0        | 210.3        | 179.0        | 141.6        | 119.8         | 54.9          |
| 1.90V           | 1175.1      | 955.4        | 730.6        | 522.7        | 350.5        | 285.1        | 203.1        | 173.4        | 136.1        | 113.9         | 54.0          |
| 1.94V           | 1062.3      | 855.4        | 654.6        | 463.3        | 323.8        | 264.9        | 192.5        | 166.3        | 130.7        | 108.9         | 52.5          |
| <b>Eos-800</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1969.1      | 1656.9       | 1369.4       | 998.7        | 635.2        | 471.2        | 320.8        | 282.0        | 229.7        | 190.1         | 85.5          |
| 1.65V           | 1900.8      | 1605.4       | 1316.3       | 967.2        | 608.9        | 459.4        | 312.8        | 275.6        | 224.5        | 185.3         | 83.4          |
| 1.70V           | 1837.4      | 1562.6       | 1273.1       | 930.6        | 584.7        | 449.9        | 306.5        | 269.3        | 221.0        | 183.7         | 82.7          |
| 1.75V           | 1762.2      | 1495.3       | 1196.9       | 877.5        | 559.2        | 441.1        | 301.0        | 261.4        | 216.2        | 182.2         | 82.0          |
| 1.80V           | 1683.0      | 1409.8       | 1118.7       | 807.8        | 538.6        | 427.7        | 293.0        | 255.8        | 211.5        | 179.0         | 80.5          |
| 1.83V           | 1584.0      | 1318.7       | 1045.4       | 755.6        | 518.8        | 418.2        | 285.1        | 248.7        | 205.9        | 175.8         | 79.1          |
| 1.85V           | 1484.0      | 1231.6       | 966.2        | 692.2        | 499.0        | 403.9        | 277.2        | 241.6        | 199.4        | 169.5         | 76.3          |
| 1.88V           | 1384.0      | 1131.6       | 871.2        | 633.6        | 473.6        | 381.7        | 269.3        | 236.0        | 194.0        | 164.7         | 74.1          |
| 1.90V           | 1247.4      | 997.9        | 790.0        | 586.9        | 449.9        | 368.3        | 259.0        | 228.1        | 186.9        | 159.5         | 71.8          |
| 1.94V           | 1128.6      | 911.8        | 698.0        | 529.1        | 414.2        | 337.0        | 236.0        | 205.1        | 167.9        | 143.7         | 64.7          |
| <b>Eos-1000</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 2461.4      | 2071.1       | 1711.7       | 1248.4       | 794.0        | 589.1        | 401.0        | 352.4        | 287.1        | 237.6         | 106.9         |
| 1.65V           | 2376.0      | 2006.7       | 1645.4       | 1209.0       | 761.1        | 574.2        | 391.1        | 344.5        | 280.7        | 231.7         | 104.2         |
| 1.70V           | 2296.8      | 1953.3       | 1591.4       | 1163.3       | 730.9        | 562.3        | 383.1        | 336.6        | 276.2        | 229.7         | 103.4         |
| 1.75V           | 2202.8      | 1869.1       | 1496.1       | 1096.9       | 698.9        | 551.4        | 376.2        | 326.7        | 270.3        | 227.7         | 102.5         |

|                 |             |              |              |              |              |              |              |              |              |               |               |
|-----------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| 1.80V           | 2103.8      | 1762.2       | 1398.4       | 1009.8       | 673.2        | 534.6        | 366.3        | 319.8        | 264.3        | 223.7         | 100.7         |
| 1.83V           | 1980.0      | 1648.4       | 1306.8       | 944.5        | 648.5        | 522.7        | 356.4        | 310.9        | 257.4        | 219.8         | 98.9          |
| 1.85V           | 1855.0      | 1539.5       | 1207.8       | 865.3        | 623.7        | 504.9        | 346.5        | 302.0        | 249.3        | 211.9         | 95.3          |
| 1.88V           | 1730.0      | 1414.5       | 1089.0       | 792.0        | 592.0        | 477.2        | 336.6        | 295.0        | 242.6        | 205.9         | 92.7          |
| 1.90V           | 1559.3      | 1247.4       | 987.5        | 733.6        | 562.3        | 460.4        | 323.7        | 285.1        | 233.6        | 199.4         | 89.7          |
| 1.94V           | 1410.8      | 1139.7       | 872.4        | 661.3        | 517.8        | 421.2        | 295.0        | 256.4        | 209.9        | 179.6         | 80.8          |
| <b>Eos-1200</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 2983.5      | 2510.4       | 2074.8       | 1513.2       | 962.4        | 714.0        | 486.0        | 427.2        | 348.0        | 288.0         | 126.6         |
| 1.65V           | 2880.0      | 2432.4       | 1994.4       | 1465.5       | 922.5        | 696.0        | 474.0        | 417.6        | 340.2        | 280.8         | 124.2         |
| 1.70V           | 2784.0      | 2367.6       | 1929.0       | 1410.0       | 885.9        | 681.6        | 464.4        | 408.0        | 334.8        | 278.4         | 121.8         |
| 1.75V           | 2670.0      | 2265.6       | 1813.5       | 1329.6       | 847.2        | 668.4        | 456.0        | 396.0        | 327.6        | 276.0         | 120.6         |
| 1.80V           | 2550.0      | 2136.0       | 1695.0       | 1224.0       | 816.0        | 648.0        | 444.0        | 387.6        | 320.4        | 271.2         | 118.8         |
| 1.83V           | 2400.0      | 1998.0       | 1584.0       | 1144.8       | 786.0        | 633.6        | 432.0        | 376.8        | 312.0        | 266.4         | 117.0         |
| 1.85V           | 2248.5      | 1866.0       | 1464.0       | 1048.8       | 756.0        | 612.0        | 420.0        | 366.0        | 302.2        | 256.8         | 114.0         |
| 1.88V           | 2097.0      | 1714.5       | 1320.0       | 960.0        | 717.6        | 578.4        | 408.0        | 357.6        | 294.0        | 249.6         | 111.0         |
| 1.90V           | 1890.0      | 1512.0       | 1197.0       | 889.2        | 681.6        | 558.0        | 392.4        | 345.6        | 283.2        | 241.7         | 106.8         |
| 1.94V           | 1710.0      | 1381.5       | 1057.5       | 801.6        | 627.6        | 510.6        | 357.6        | 310.8        | 254.4        | 217.7         | 105.6         |
| <b>Eos-1500</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 3692.1      | 3106.6       | 2567.6       | 1872.6       | 1191.0       | 883.6        | 601.4        | 528.7        | 430.7        | 356.4         | 160.4         |
| 1.65V           | 3564.0      | 3010.1       | 2468.1       | 1813.6       | 1141.6       | 861.3        | 586.6        | 516.8        | 421.0        | 347.5         | 156.4         |
| 1.70V           | 3445.2      | 2929.9       | 2387.1       | 1744.9       | 1096.3       | 843.5        | 574.7        | 504.9        | 414.3        | 344.5         | 155.0         |
| 1.75V           | 3304.1      | 2803.7       | 2244.2       | 1645.4       | 1048.4       | 827.1        | 564.3        | 490.1        | 405.4        | 341.6         | 153.7         |
| 1.80V           | 3155.6      | 2643.3       | 2097.6       | 1514.7       | 1009.8       | 801.9        | 549.5        | 479.7        | 396.5        | 335.6         | 151.0         |
| 1.83V           | 2970.0      | 2472.5       | 1960.2       | 1416.7       | 972.7        | 784.1        | 534.6        | 466.3        | 386.1        | 329.7         | 148.4         |
| 1.85V           | 2782.5      | 2309.2       | 1811.7       | 1297.9       | 935.6        | 757.4        | 519.8        | 452.9        | 373.9        | 317.8         | 143.0         |
| 1.88V           | 2595.0      | 2121.7       | 1633.5       | 1188.0       | 888.0        | 715.8        | 504.9        | 442.5        | 363.8        | 308.9         | 139.0         |
| 1.90V           | 2338.9      | 1871.1       | 1481.3       | 1100.4       | 843.5        | 690.5        | 485.6        | 427.7        | 350.5        | 299.1         | 134.6         |
| 1.94V           | 2116.1      | 1709.6       | 1308.7       | 992.0        | 776.7        | 631.9        | 442.5        | 384.6        | 314.8        | 269.4         | 121.2         |
| <b>Eos-2000</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 4922.8      | 4142.2       | 3423.4       | 2496.8       | 1588.0       | 1178.1       | 801.9        | 704.9        | 574.2        | 475.2         | 213.8         |
| 1.65V           | 4752.0      | 4013.5       | 3290.8       | 2418.1       | 1522.1       | 1148.4       | 782.1        | 689.0        | 561.3        | 463.3         | 208.5         |
| 1.70V           | 4593.6      | 3906.5       | 3182.9       | 2326.5       | 1461.7       | 1124.6       | 766.3        | 673.2        | 552.4        | 459.4         | 206.7         |
| 1.75V           | 4405.5      | 3738.2       | 2992.3       | 2193.8       | 1397.9       | 1102.9       | 752.4        | 653.4        | 540.5        | 455.4         | 204.9         |
| 1.80V           | 4207.5      | 3524.4       | 2796.8       | 2019.6       | 1346.4       | 1069.2       | 732.6        | 639.5        | 528.7        | 447.5         | 201.4         |
| 1.83V           | 3960.0      | 3296.7       | 2613.6       | 1888.9       | 1296.9       | 1045.4       | 712.8        | 621.7        | 514.8        | 439.6         | 197.8         |
| 1.85V           | 3710.0      | 3078.9       | 2415.6       | 1730.5       | 1247.4       | 1009.8       | 693.0        | 603.9        | 498.6        | 423.7         | 190.7         |
| 1.88V           | 3460.1      | 2828.9       | 2178.0       | 1584.0       | 1184.0       | 954.4        | 673.2        | 590.0        | 485.1        | 411.8         | 185.3         |
| 1.90V           | 3118.5      | 2494.8       | 1975.1       | 1467.2       | 1124.6       | 920.7        | 647.5        | 570.2        | 467.3        | 398.8         | 179.4         |
| 1.94V           | 2821.5      | 2279.5       | 1744.9       | 1322.6       | 1035.5       | 842.5        | 590.0        | 512.8        | 419.8        | 359.2         | 161.6         |
| <b>Eos-800A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V           | 1973.0      | 1660.2       | 1372.1       | 1000.7       | 636.5        | 472.2        | 321.4        | 282.5        | 230.1        | 190.5         | 85.7          |
| 1.65V           | 1904.6      | 1608.6       | 1318.9       | 969.2        | 610.1        | 460.3        | 313.5        | 276.2        | 225.0        | 185.7         | 83.5          |
| 1.70V           | 1841.1      | 1565.7       | 1275.7       | 932.5        | 585.9        | 450.8        | 307.1        | 269.8        | 221.4        | 184.1         | 82.7          |
| 1.75V           | 1765.7      | 1498.3       | 1199.3       | 879.3        | 560.3        | 442.0        | 301.6        | 261.9        | 216.6        | 182.5         | 82.1          |

|                  |             |              |              |              |              |              |              |              |              |               |               |
|------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| 1.80V            | 1686.4      | 1412.6       | 1120.9       | 809.5        | 539.6        | 428.5        | 293.6        | 256.3        | 211.9        | 179.3         | 80.5          |
| 1.83V            | 1587.2      | 1321.3       | 1047.5       | 757.1        | 519.8        | 419.0        | 285.7        | 249.2        | 206.3        | 176.2         | 79.2          |
| 1.85V            | 1487.0      | 1234.0       | 968.2        | 693.6        | 500.0        | 404.7        | 277.8        | 242.0        | 199.8        | 169.8         | 76.3          |
| 1.88V            | 1386.8      | 1133.8       | 872.9        | 634.9        | 474.6        | 382.5        | 269.8        | 236.5        | 194.4        | 165.1         | 74.2          |
| 1.90V            | 1249.9      | 999.9        | 791.6        | 588.0        | 450.8        | 369.0        | 259.5        | 228.6        | 187.3        | 159.8         | 71.8          |
| 1.94V            | 1130.9      | 913.6        | 699.3        | 530.1        | 415.0        | 337.7        | 236.5        | 205.5        | 168.2        | 144.0         | 64.8          |
| <b>Eos-1000A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 2461.4      | 2071.1       | 1711.7       | 1248.4       | 794.0        | 589.1        | 401.0        | 352.4        | 287.1        | 237.6         | 106.9         |
| 1.65V            | 2376.0      | 2006.7       | 1645.4       | 1209.0       | 761.1        | 574.2        | 391.1        | 344.5        | 280.7        | 231.7         | 104.2         |
| 1.70V            | 2296.8      | 1953.3       | 1591.4       | 1163.3       | 730.9        | 562.3        | 383.1        | 336.6        | 276.2        | 229.7         | 103.4         |
| 1.75V            | 2202.8      | 1869.1       | 1496.1       | 1096.9       | 698.9        | 551.4        | 376.2        | 326.7        | 270.3        | 227.7         | 102.5         |
| 1.80V            | 2103.8      | 1762.2       | 1398.4       | 1009.8       | 673.2        | 534.6        | 366.3        | 319.8        | 264.3        | 223.7         | 100.7         |
| 1.83V            | 1980.0      | 1648.4       | 1306.8       | 944.5        | 648.5        | 522.7        | 356.4        | 310.9        | 257.4        | 219.8         | 98.9          |
| 1.85V            | 1855.0      | 1539.5       | 1207.8       | 865.3        | 623.7        | 504.9        | 346.5        | 302.0        | 249.3        | 211.9         | 95.3          |
| 1.88V            | 1730.0      | 1414.5       | 1089.0       | 792.0        | 592.0        | 477.2        | 336.6        | 295.0        | 242.6        | 205.9         | 92.7          |
| 1.90V            | 1559.3      | 1247.4       | 987.5        | 733.6        | 562.3        | 460.4        | 323.7        | 285.1        | 233.6        | 199.4         | 89.7          |
| 1.94V            | 1410.8      | 1139.7       | 872.4        | 661.3        | 517.8        | 421.2        | 295.0        | 256.4        | 209.9        | 179.6         | 80.8          |
| <b>Eos-1500A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 3696        | 3110         | 2570         | 1875         | 1192         | 885          | 602          | 529          | 431          | 357           | 161           |
| 1.65V            | 3568        | 3013         | 2471         | 1815         | 1143         | 862          | 587          | 517          | 422          | 348           | 157           |
| 1.70V            | 3449        | 2933         | 2390         | 1747         | 1097         | 844          | 575          | 505          | 415          | 345           | 155           |
| 1.75V            | 3308        | 2807         | 2246         | 1647         | 1049         | 828          | 565          | 491          | 406          | 342           | 154           |
| 1.80V            | 3159        | 2646         | 2100         | 1516         | 1011         | 803          | 550          | 480          | 397          | 336           | 151           |
| 1.83V            | 2973        | 2475         | 1962         | 1418         | 974          | 785          | 535          | 467          | 386          | 330           | 148           |
| 1.85V            | 2785        | 2312         | 1814         | 1299         | 937          | 758          | 520          | 454          | 374          | 318           | 143           |
| 1.88V            | 2598        | 2124         | 1635         | 1189         | 889          | 717          | 505          | 443          | 364          | 309           | 139           |
| 1.90V            | 2341        | 1873         | 1483         | 1102         | 844          | 691          | 486          | 428          | 351          | 299           | 135           |
| 1.94V            | 2118        | 1711         | 1310         | 993          | 777          | 632          | 443          | 385          | 315          | 270           | 121           |
| <b>Eos-2000A</b> | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 4928        | 4146         | 3427         | 2499         | 1590         | 1179         | 803          | 706          | 575          | 476           | 214           |
| 1.65V            | 4757        | 4017         | 3294         | 2420         | 1524         | 1150         | 783          | 690          | 562          | 464           | 209           |
| 1.70V            | 4598        | 3910         | 3186         | 2329         | 1463         | 1126         | 767          | 674          | 553          | 460           | 207           |
| 1.75V            | 4410        | 3742         | 2995         | 2196         | 1399         | 1104         | 753          | 654          | 541          | 456           | 205           |
| 1.80V            | 4212        | 3528         | 2800         | 2022         | 1348         | 1070         | 733          | 640          | 529          | 448           | 202           |
| 1.83V            | 3964        | 3300         | 2616         | 1891         | 1298         | 1046         | 714          | 622          | 515          | 440           | 198           |
| 1.85V            | 3714        | 3082         | 2418         | 1732         | 1249         | 1011         | 694          | 605          | 499          | 424           | 191           |
| 1.88V            | 3464        | 2832         | 2180         | 1586         | 1185         | 955          | 674          | 591          | 486          | 412           | 185           |
| 1.90V            | 3122        | 2497         | 1977         | 1469         | 1126         | 922          | 648          | 571          | 468          | 399           | 180           |
| 1.94V            | 2824        | 2282         | 1747         | 1324         | 1037         | 843          | 591          | 513          | 420          | 360           | 162           |
| <b>Eos-3000</b>  | <b>5min</b> | <b>15min</b> | <b>30min</b> | <b>60min</b> | <b>2hour</b> | <b>3hour</b> | <b>5hour</b> | <b>6hour</b> | <b>8hour</b> | <b>10hour</b> | <b>24hour</b> |
| 1.60V            | 7385        | 6214         | 5136         | 3746         | 2382         | 1767         | 1203         | 1057         | 861          | 713           | 321           |
| 1.65V            | 7129        | 6021         | 4937         | 3627         | 2283         | 1723         | 1173         | 1034         | 842          | 695           | 313           |
| 1.70V            | 6891        | 5860         | 4775         | 3490         | 2193         | 1687         | 1150         | 1010         | 829          | 689           | 310           |
| 1.75V            | 6609        | 5608         | 4489         | 3291         | 2097         | 1654         | 1129         | 980          | 811          | 683           | 307           |

|       |      |      |      |      |      |      |      |     |     |     |     |
|-------|------|------|------|------|------|------|------|-----|-----|-----|-----|
| 1.80V | 6312 | 5287 | 4196 | 3030 | 2020 | 1604 | 1099 | 959 | 793 | 671 | 302 |
| 1.83V | 5941 | 4946 | 3921 | 2834 | 1946 | 1568 | 1069 | 933 | 772 | 659 | 297 |
| 1.85V | 5566 | 4619 | 3624 | 2596 | 1871 | 1515 | 1040 | 906 | 748 | 636 | 286 |
| 1.90V | 4678 | 3743 | 2963 | 2201 | 1687 | 1381 | 971  | 855 | 701 | 598 | 269 |
| 1.94V | 4233 | 3420 | 2618 | 1984 | 1553 | 1264 | 885  | 769 | 630 | 539 | 242 |

#### 4. Internal resistance and short circuit current

The internal resistance of the battery is a dynamic nonlinear parameter that is continuously changed along with the temperature and discharge state. The internal resistance is the lowest when battery is fully charged. The table 2-2 shows the internal resistance and short circuit current of Narada battery in fully charged state according to the IEC60896 standard. Pay attention to the battery to short-circuit causes the battery voltage to reduce to 0V, and will cause the battery internal component damaged.

Table2-3 Internal resistance and short circuit current (25°C)

| type      | Internal Resistance (mΩ) | Short Circuit Current (A) |
|-----------|--------------------------|---------------------------|
| Eos-200   | 0.66                     | 3084                      |
| Eos-260   | 0.54                     | 3400                      |
| Eos-300   | 0.47                     | 3960                      |
| Eos-400   | 0.35                     | 5089                      |
| Eos-500   | 0.33                     | 6009                      |
| Eos-600   | 0.28                     | 7178                      |
| Eos-800   | 0.21                     | 9061                      |
| Eos-1000  | 0.18                     | 10696                     |
| Eos-1200  | 0.17                     | 12068                     |
| Eos-1500  | 0.14                     | 14068                     |
| Eos-2000  | 0.11                     | 17217                     |
| Eos-800A  | 0.20                     | 9296                      |
| Eos-1000A | 0.17                     | 12880                     |
| Eos-1500A | 0.14                     | 14920                     |
| Eos-2000A | 0.11                     | 27589                     |
| Eos-3000  | 0.10                     | 31879                     |



## Chapter Three Operation and Maintenance

### 1. Parameters Setup

**Table3-1 Switching power supply parameter setup table (48V system)**

| Parameter name  | Normal power supply       | Tough power supply  |
|---|---------------------------|---------------------|
| Floating Voltage (V)  | 54                        | 54                  |
| Equalization Voltage (V)  | 56.4                      | 56.4                |
| Charging Current (A)  | 0.1C <sub>10</sub>        | 0.1C <sub>10</sub>  |
| Limited Current For Charge (A)  | 0.20C <sub>10</sub>       | 0.20C <sub>10</sub> |
| Equalization Charge Cycle (day)   | 90                        | 30                  |
| Equalization Charge Time (h)  | 24                        | 24                  |
| Condition to Change Float Charge To Equalization Charge (mA/Ah)         | >50                       | >50                 |
| Condition To Change Equalization Charge To Float Charge (mA/Ah)         | <5                        | <5                  |
| LVL D (V)   | 45.6                      | 46.5                |
| LVBD (V)  | Please refer to table 3-2 |                     |
| LVBD Recover Voltage (V)  | 49                        | 50                  |
| High Voltage Warning (V)  | 57.6                      | 57.6                |
| Low Voltage Warning (V)   | 46                        | 47                  |
| Temperature Compensate Ratio With Floating Voltage (mV/°C per cell)     | -3                        | -3                  |
| Temperature Compensate Ratio With Equalization Voltage (mV/°C per cell) | -5                        | -5                  |
| High Temperature Warning (°C)   | 35                        | 35                  |

1. The voltage in above table is at 25°C. Please adjust the data according to table 3-3 at other temperature.
2. Please contact the manufacture about standard for normal power supply or tough power supply.
3. Above are standard setup parameters in table 3-1. We suggest you to set up end voltage (LVBD) based on different load current to make the battery life longer. Please refer to table 3-2.

Table 3-2 Voltage setup parameter of LVBD and LVLD

| Load current (A)                  | End voltage (V/cell) | LVBD for 48V system (V) | LVLD for 48V system (V) |
|-----------------------------------|----------------------|-------------------------|-------------------------|
| $I < 0.025C_{10}$                 | 1.97                 | 47.3                    | 47.3                    |
| $0.025C_{10} \leq I < 0.05C_{10}$ | 1.92                 | 46.1                    | 46.1                    |
| $0.05C_{10} \leq I < 0.1C_{10}$   | 1.87                 | 44.9                    | 45.6                    |
| $0.1C_{10} \leq I < 0.2C_{10}$    | 1.83                 | 44                      | 45.6                    |
| $0.2C_{10} \leq I < 0.5C_{10}$    | 1.75                 | 42                      | 45.6                    |

If the battery is not recharged in time after discharge, or the power is off again during recharge, the insufficient-charged batteries will be frequently discharge, thus the batteries will lose part of capacity in short period. And it may cause capacity loss at initial stage and the batteries will be rejected if the situation is serious.

## 2. Capacity and Influence Factor

The capacity of battery is the capacity that battery can be discharged in the established conditions, expressed as signal C. The usual unit of capacity is ampere-hour, shortened as AH. The rated time is marked in the right and low corner of C, i.e.  $C_{10}$  is the capacity at 10 hours rate;  $C_3$  is the capacity at 3 hours rate.

The capacity can be expressed in Rated Capacity or Actual Capacity. For Rated Capacity of Eos battery, please see Table 1-1. The Actual Capacity is the actual output capacity in certain discharge conditions, which is equal to product of the discharge current and the discharge time, the unit is AH. The actual capacity is effected by discharge rate, discharge mode, end voltage and temperature.

## 3. Ambient Temperature vs. Battery

The recommendation temperature for Eos battery is 15 °C ~ 25 °C. Used at high or low temperature, battery performance will be affected. Table 3-3 is the working temperature range for battery.

Table 3-3 Working temperature range for battery

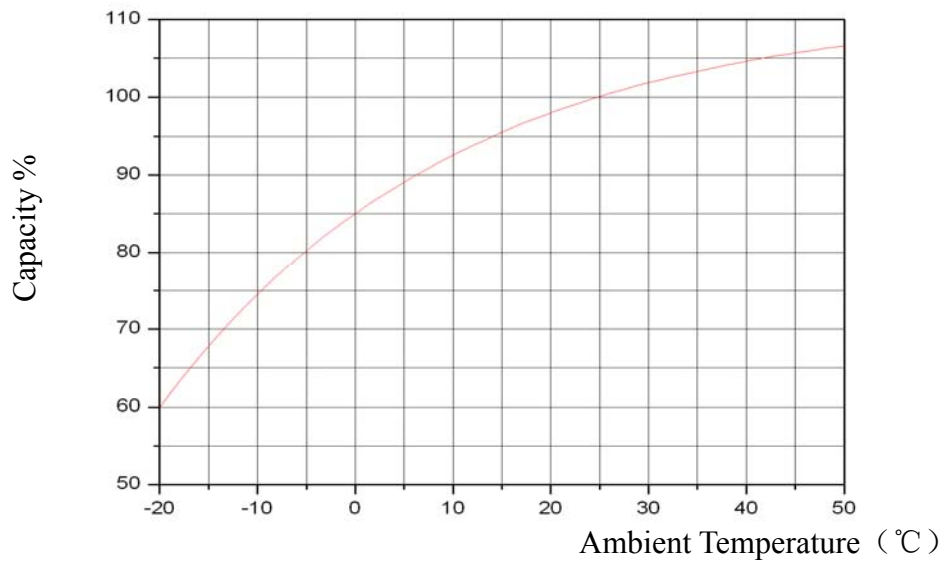
| Working condition | Temperature range | Recommended temperature |
|-------------------|-------------------|-------------------------|
| Discharge         | -40°C ~ 50°C      | 15°C ~ 25°C             |
| Charge            | -20°C ~ 50°C      | 15°C ~ 25°C             |
| Storage           | -20°C ~ 40°C      | 15°C ~ 25°C             |

Temperature affects capacity of the battery. Fig. 3-1 is the available capacity (10h rated, end voltage 1.80Vpc) curve vs. ambient temperature. When the temperature is low, the capacity will decrease, for example, the capacity will decrease 20% if temperature

decreases from 25 °C to 0°C; And too low temperature will cause battery long term insufficient charged, also will make negative plates sulfate and make battery unable to discharge.

The capacity will increase at some range when temperature rises. For example the capacity will increase 5% if temperature raises from 25°C to 35°C. But when the temperature go up further, the capacity will increase slowly, and at last stop increasing. However, high temperature will quicken up plates' corrosion and cause water loss, thus shortens battery's life.

Fig.3-1 Available Capacity (10h rate) Curve VS. Ambient Temperature



### 3.1 Temperature and Floating Voltage, Equalization Voltage

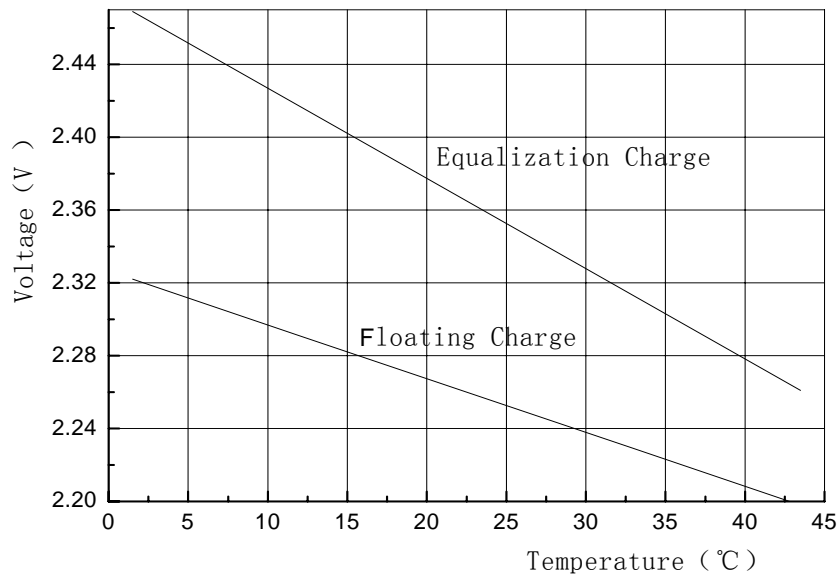
The purpose to select certain floating voltage is make the battery operate in best conditions. If the floating voltage is higher, the floating current is also higher; it will accelerate the corruption of grids and shorten the life of the battery. If the floating voltage is lower, the battery can't be kept in fully charged state, this will crystallize PbSO<sub>4</sub>, decrease the capacity, and also shorten the life of the battery. At 25°C, the floating voltage is 2.25V, at other temperature, please adjust according to Table 3-4. The temperature compensation coefficient for float charge is -3mV/°C/cell. Valve regulated sealed lead acid battery need to be equalized charge regularly, in order to guarantees the battery normal operation. At 25°C, Eos battery's Equalization voltage is 2.35V. It need to be adjusted by ambient temperature, the temperature compensation coefficient for equalizing charge is -5mV/°C/cell.

Table 3-4 Relationship of ambient temperature and voltage

| Ambient Temperature (°C) | Float Voltage (V/cell) | Equalization voltage (V/cell) |
|--------------------------|------------------------|-------------------------------|
| 5                        | 2.31                   | 2.45                          |

|    |      |      |
|----|------|------|
| 10 | 2.30 | 2.43 |
| 15 | 2.28 | 2.40 |
| 20 | 2.27 | 2.38 |
| 25 | 2.25 | 2.35 |
| 30 | 2.24 | 2.33 |
| 35 | 2.22 | 2.30 |
| 40 | 2.21 | 2.28 |

Fig. 3—2 The Voltage Setting Curve Vs. Ambient Temperature



### 3.2 Ambient temperature vs. Battery Life

The high temperature will damage the battery, reduce the battery life. When temperature exceeds 25°C, the battery life will decrease half per 10°C temperature raise. For example, the design life of battery is 10 years at 25°C, if the battery is operate at 35°C for long term, the life will be 5 years. Below is the formula:

$$L_{25} = L_T \times 2^{(T-25)/10}$$

Notes: T the actual ambient temperature;

$L_T$  is designed life at T ambient temperature

$L_{25}$  is designed life at 25°C ambient temperature

Ambient temperature elevating, also will accelerate the battery grids corrosion and the battery water loss, thus will greatly reduce the battery life. So it is important to control the ambient temperature. When heat is accumulated to a certain degree, it will damage the battery, seriously will lead to thermal run away. If indoor temperature reaches too high, please improve the ambient temperature by making room ventilated, etc. The battery spacing cannot to be less than 10mm, at the same time regulating cell floating and equalization voltage value according to handbook's request.

### 3.3 Conductance, Resistance vs. Capacity

There is a certain corresponding relationship between conductance & resistance and battery capacity. We suggest to test battery conductance and resistance data at difficult stage with same type instruments from same factory. Conductance and resistance data is only a reference to judge whether battery is good. These data cannot replace loading test to judge whether battery is good. We recommend to test these data on the surface or side of battery post. If there are several pairs of post, please test on nearest pair of post.

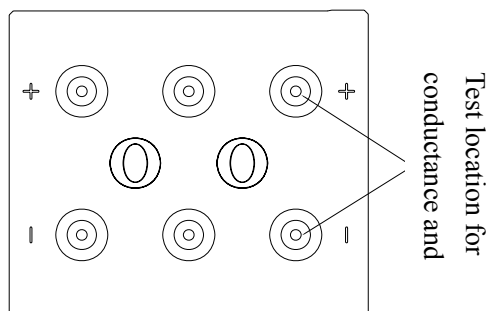


Figure 3-3 Test location for conductance and resistance

## 4. Choose battery

If you choose Narada Eos Series battery, please refer to diagram3-3 monomer lectotype curve for selecting battery capacity.

4.1 Firstly, confirm the end-of-discharge voltage. For example, end voltage for single cell is 1.80V.

4.2 Secondly, confirm the continuous working period of battery group and its discharge current. For example, it is required to reach 125A of constant flow output during the power supply period of battery group for continuous 3 hours; then according to the corresponding curve in diagram 2-3, the minimum capacity requirement will be Eos-500.

4.3 Lastly, confirm the ambient temperature. At room temperature of 25°C, please choose Eos-500; Otherwise, please refer to diagram 3-1 to confirm the temperature coefficient, i.e., if temperature bellows 0°C, the capacity will reach 80% while it is around 25°C, in that case, please divided by 0.8.

4.4 In order to assure the service life of battery, the depth of discharge should not be too deep every time, that is to say, it's better not to exceed more than 80%. Especially for those areas that use battery more frequently. It is necessary that the batteries have spare capacity every time after discharge, in order to prevent the damage caused by long-term of insufficient charge.

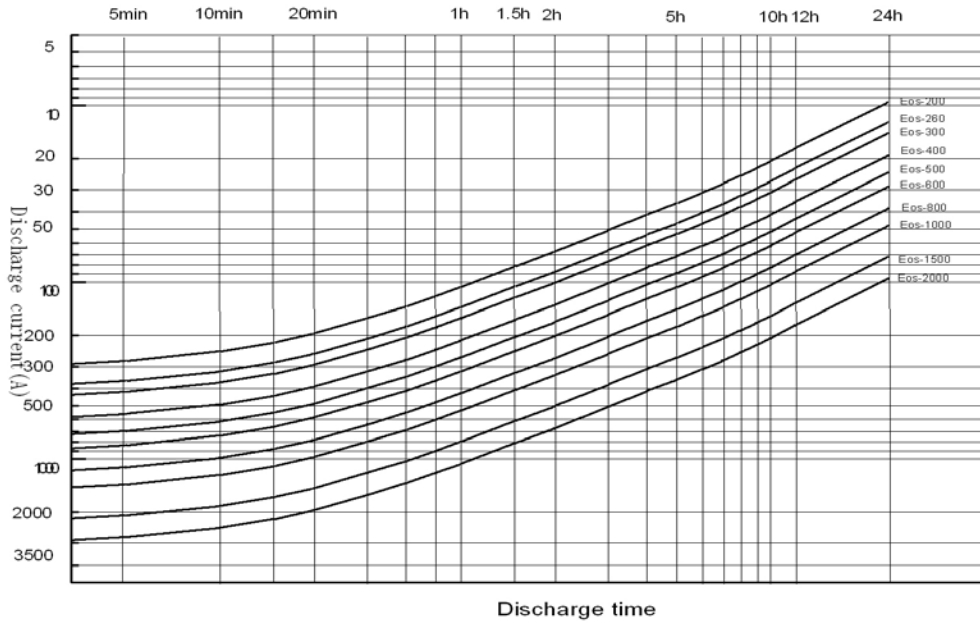


Fig. 3-4 Battery Selection Mode (end voltage 1.80Vpc)

## 5. Requirement for Charge

### 5.1 Periodically Equalization Charge

The battery needs an equalization charge after floating operation over three months, or the voltage of at least two batteries are lower than 2.18V. The method of equalization charge is constant current and limited voltage, as follows: charge with constant current of  $0.1C_{10}A \sim 0.20C_{10}A$  till the average voltage reaches equalization charge voltage of 2.35Vpc (25°C), then keep charging with equalization charge voltage, meanwhile, the current is reduced, till the charge finished. The charging time is 24 hours.

### 5.2 Charge after discharge

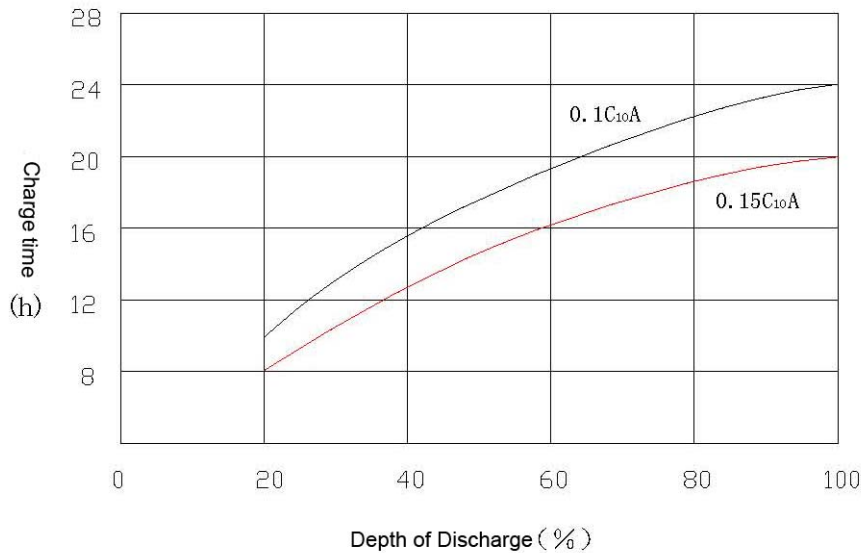
After discharge, the batteries should be charged in time. The charge method is constant current limit voltage as follows: charge with constant current of  $0.1C_{10}A \sim 0.20C_{10}A$  till the average voltage reaches a certain voltage, then keep charging with this voltage, meanwhile, the current is reduced, till the charge finished.

The certain voltage could be equalization voltage or float voltage. When the depth of discharge is larger (normally larger than 10%), equalization voltage is recommended so as to give fully charge to the battery. We can also determine charge voltage according to initial current. When the current is larger than  $0.05C_{10}A$  (reference current to change to equalization charge), equalization voltage is recommended. The charge time is 24 hours. We can also setup the charge voltage according to different DOD, different charge current shown in figure 3-4, or we can judge according to charge current value.

Normally, the batteries are fully charged when the value of charge current is not changed for continuous three hours at the stage of constant voltage charge,

Sometimes, we need to charge a battery in a short time, we can raise charge current, but not higher than  $0.25C_{10A}$ .

Fig .3-4 The relationship between DOD and charge time



## 6. Storage

The storage area must be clean, ventilated, dry and without direct sunshine. All lead acid batteries lose capacity when standing on open circuit because of self-discharge. The result is that the voltage of open circuit is decreased, and the capacity also decreased. The self-discharge rate is related with ambient temperature. The self-discharge degree is smaller when the ambient temperature is lower, otherwise is larger. Batteries should be supplementary charged if they have been stored for six months or the open circuit voltage is lower than 2.10V/Cell. The equalization charge method should be adopted. All batteries, which are ready to store, should be fully charged before storage. It's suggested to record storage time in periodic maintenance record and record the time when another necessary supplementary charge should be made. The quality certificates of Eos batteries record the latest charge time of the batteries, next charge time can be calculated according to this charge time.

## 7. Maintenance

In order to assure service life, the batteries should be correctly inspected and maintained. The maintenance methods of EOS batteries are recommended as follows:

### 7.1 Monthly Maintenance

- Keep the battery-room clean.
- Measure and record the ambient temperature of the battery-room.
- Check each battery's cleanness; check damage and overheating trace of the

terminal, container and lid.

- Measure and record the total voltage and floating current of the battery system.

## 7.2 Quarterly Maintenance

- Repeat monthly inspection.
- Measure and record floating voltage of every on-line battery. If more than two cells' voltage is less than 2.18Vpc after temperature compensation, the batteries need to be equalization charged.

## 7.3 Yearly Maintenance

- Repeat quarterly maintenance and inspection.
- Check whether connectors are loose or not every year and tight them
- Make a discharge test to check with exact load every year, discharging 30-40% of rated capacity. Make an 80%DOD capacity test every year after three years' operation.

## 7.4 Operation and Maintenance Precautions

### Insufficient Charge

If the floating voltage is not set correctly (too low or not compensate according to temperature), the battery system will in an insufficient charge state for a long period of time. When the electricity is out, the battery may not be able to work because the acid is satirized and the capacity is decreased.

### Over Charge

If we neglect the performance of rectifier to transfer floating charge to equalization charge. If the rectifier cannot transfer charge modes because of its wrong performance or no adjustment, the battery system is always in an equalization charge state. Thus may cause serious problems for battery, such as water loss, life decrease, thermal runaway, deformation, etc.

### Too low or too high temperature

We have mentioned that too low temperature will affect the capacity of battery. While too high temperature will also cause problems, such as water loss, life decrease, thermal runaway, deformation, etc.

### Too low end voltage

The end voltage is also an important parameter for battery. The battery shall stop discharge when reach a certain voltage (The normal end voltage is 1.8Vpc for 10 hours rated). If the end voltage is too low, it will be difficult to recharge the battery and decrease the charge efficiency, thus reduce the life of battery.

### Long time storage after discharge

If the battery is put aside without charge for a long time after discharge, it will affect the capacity and life of the battery, because some large size  $\text{PbSO}_4$  will be created in the negative, which are difficult to transfer to active Pb. Thus it will affect battery life and capacity



## After-sales Service / Customer Service Hotline

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Email: [intl@narada.biz](mailto:intl@narada.biz)

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Fax: +65 6749 3498

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**Annex 1**

VRLA Battery Regular Maintenance Record

| Type              |             | Place             |             |
|-------------------|-------------|-------------------|-------------|
| Status            |             | Number of battery |             |
| Total Voltage (V) | Current (A) | Temperature       |             |
| No.               | Voltage (V) | No.               | Voltage (V) |
| 1                 |             | 13                |             |
| 2                 |             | 14                |             |
| 3                 |             | 15                |             |
| 4                 |             | 16                |             |
| 5                 |             | 17                |             |
| 6                 |             | 18                |             |
| 7                 |             | 19                |             |
| 8                 |             | 20                |             |
| 9                 |             | 21                |             |
| 10                |             | 22                |             |
| 11                |             | 23                |             |
| 12                |             | 24                |             |
|                   |             |                   |             |
|                   |             |                   |             |
|                   |             |                   |             |
|                   |             |                   |             |
| Check by sight    |             |                   |             |
| Result:           |             |                   |             |
| Tester:           |             | Date:             |             |