

BATTERY CSB



HRL series
High Rate
Long Life

PRODUCT APPLICATION ▼

Confidence & Creativity
Service & Sincerity
Belief & Bravery

HRL

HRL series

HRL-series batteries are specially designed for high rate discharge applications. They are small, lightweight and offer a service life of up to 10 years in standby use, or more than 260 cycles at 100% discharge. Because of its innovative design, HRL-series output energy is 20% higher than comparable products. As with all CSB batteries, they are rechargeable, highly efficient, maintenance free, leakproof, viable in any orientation and ISO/UL certified.



Performance

- Innovative plate structure greatly increases energy/density ratios.
- Increased current delivery for high-rate discharge.
- Up to 50% greater resistance to grid growth under optimal temperature.
- Reduced internal resistance for superior performance.
- Uniform plate formation for consistent capacity.
- No-spill design.
- Viable in any orientation.
- Maintenance free.

Long service life

- Up to 10 years expected life under normal float charge conditions at 25°C (77°F).
- Extended shelf life (up to 14 months at 20°C).

Reliability

- CSB manufactured batteries are 100% 2-cycle tested by CCDS.
- CSB-manufactured batteries are UL-recognized components under UL 924 and UL 1989. CSB file number MH 14533.
- ISO 9001/14001 certified.

Applications

Standby use

- UPS power supply.
- Workstation UPS.
- Emergency lighting equipment.
- Precision instrument backup power.
- Fire alarm and security systems.
- Communications and electrical equipment.
- Office computers, microcomputers and OA equipment.
- Robots, control equipment and other FA equipment.
- Emergency power supply in power plants and substations.

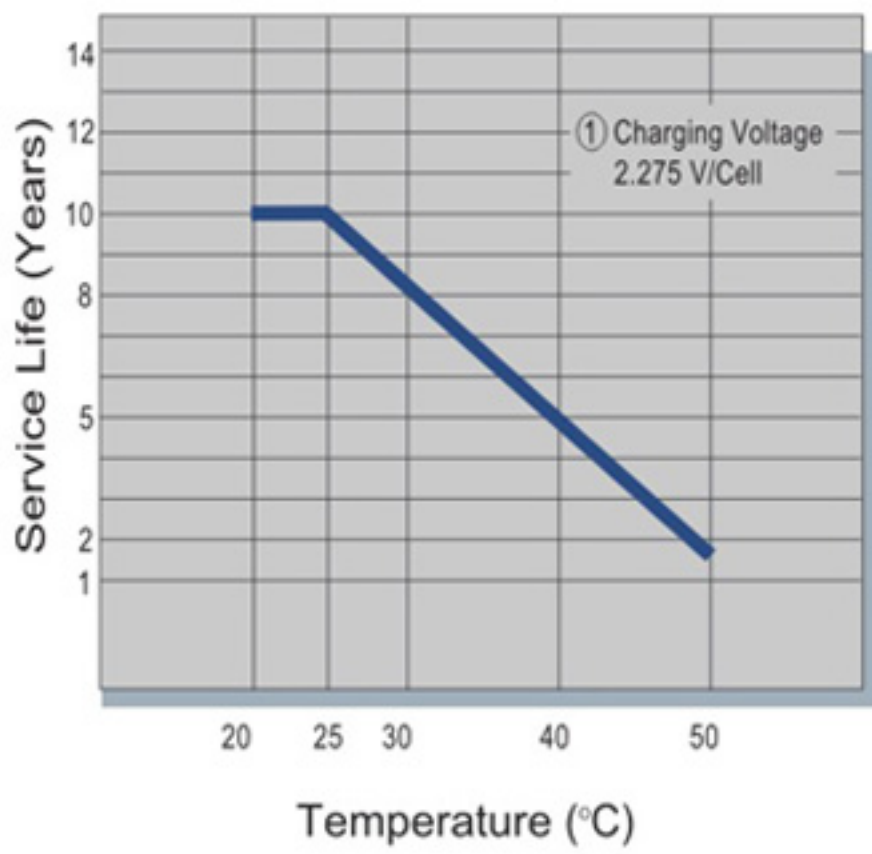
Cycle use

- Portable measuring equipment.
- Cameras and photographic equipment.
- Various toys and hobby equipment.

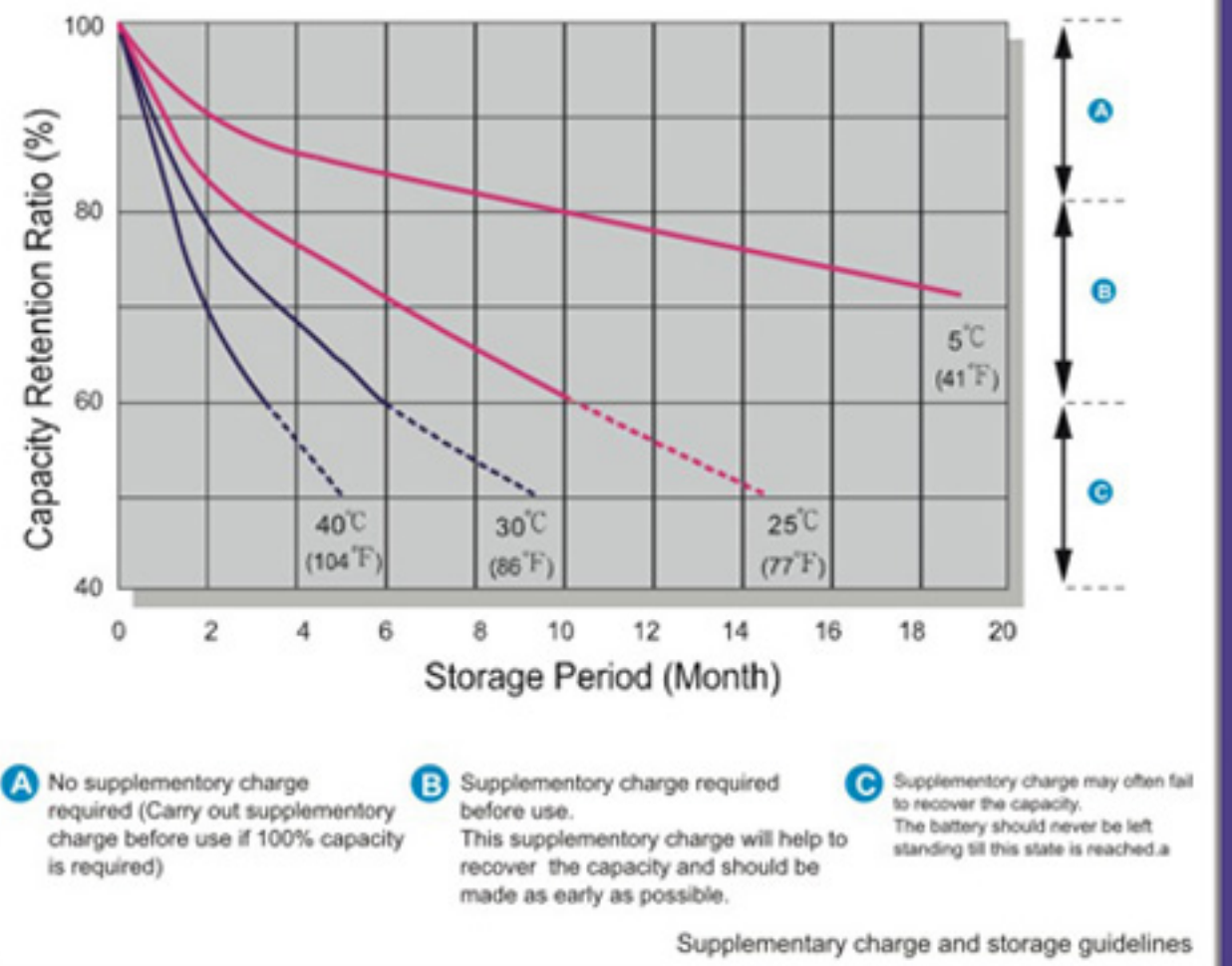
Solar Cell Power Generation

- Street lighting.
- Portable power supply.
- Water pumping.
- Rural power systems.

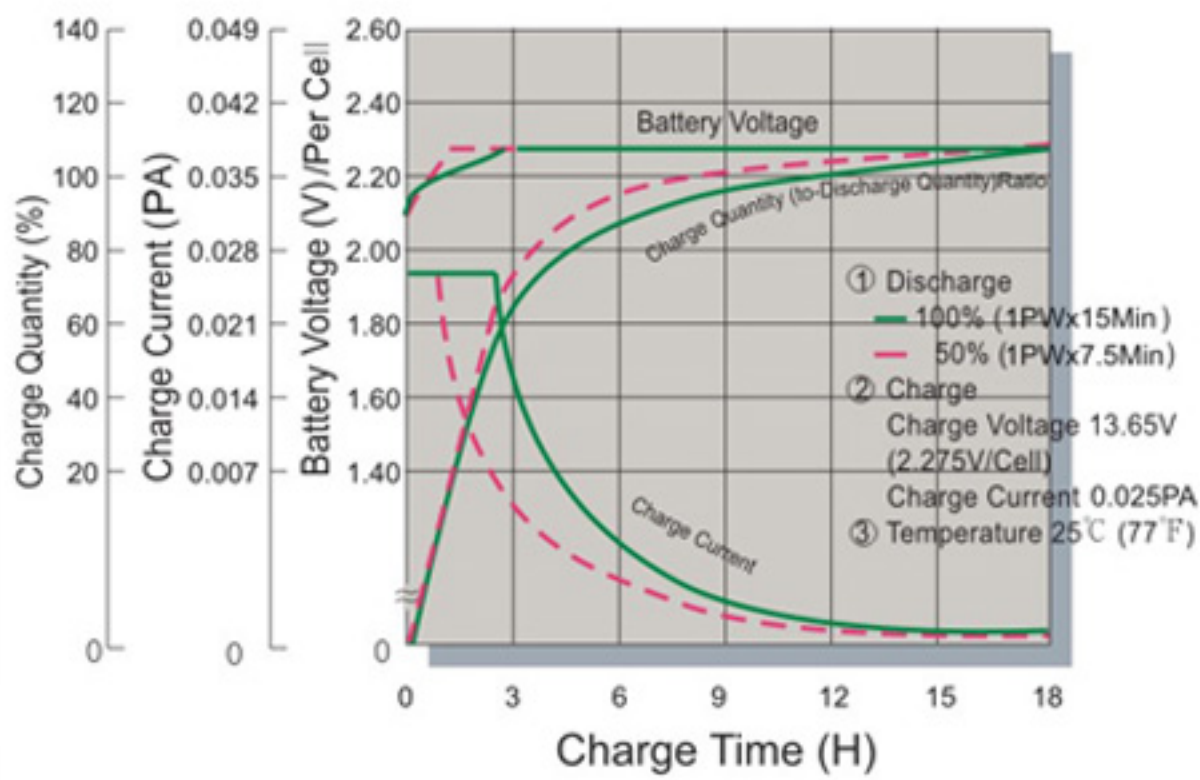
Trickle (or Float) Service Life



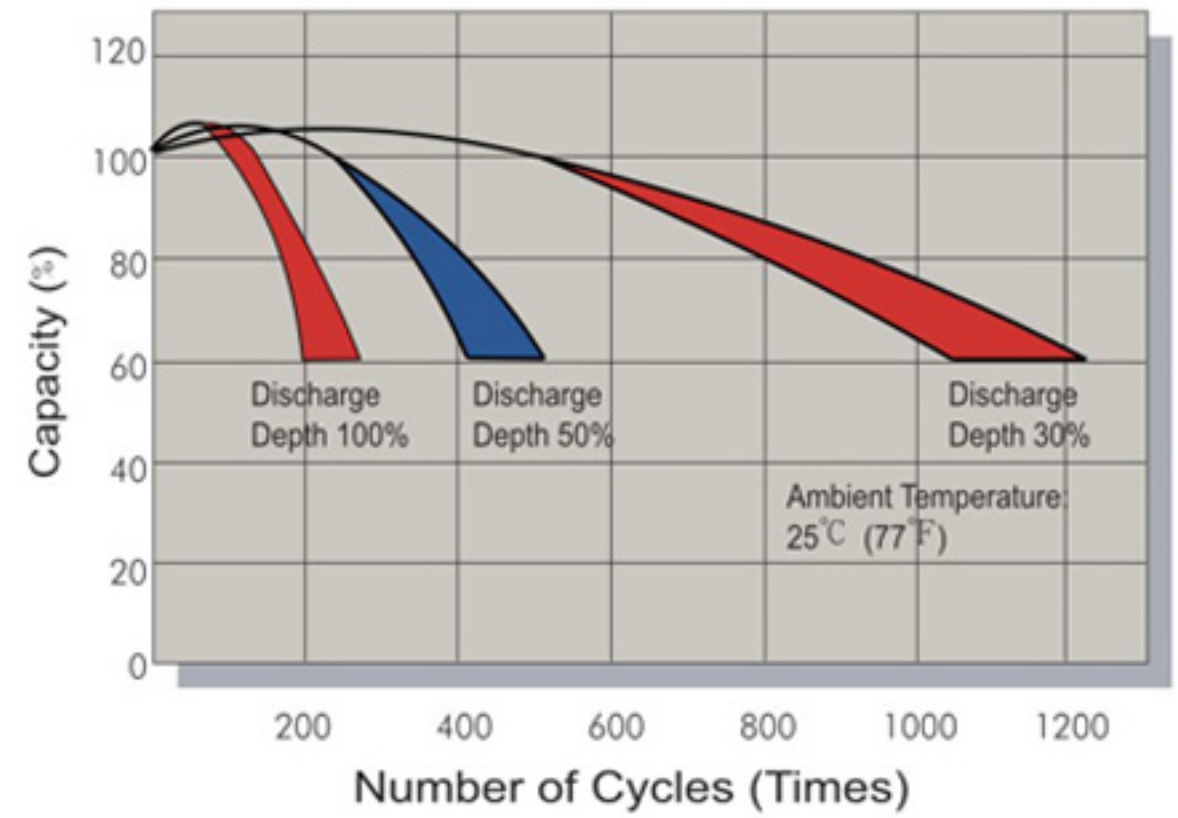
Capacity Retention Characteristic



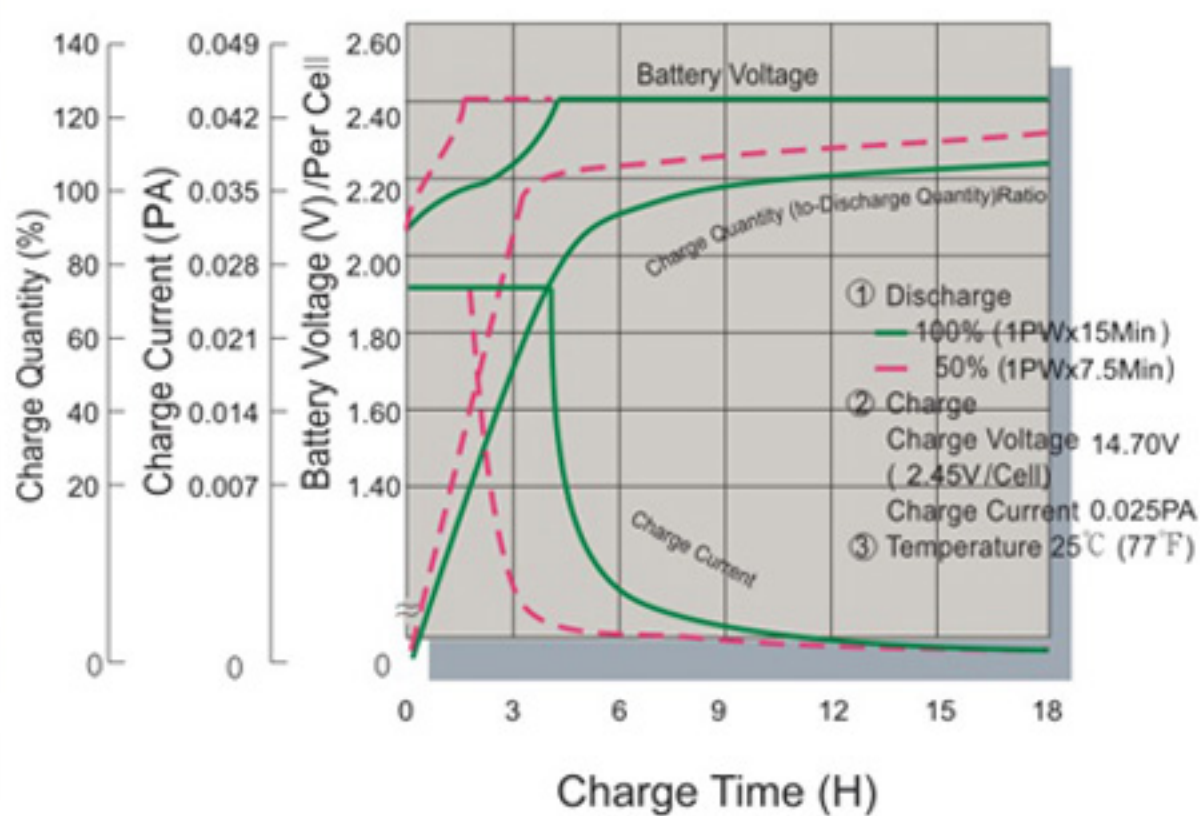
Battery Voltage and Charge Time for Standby Use



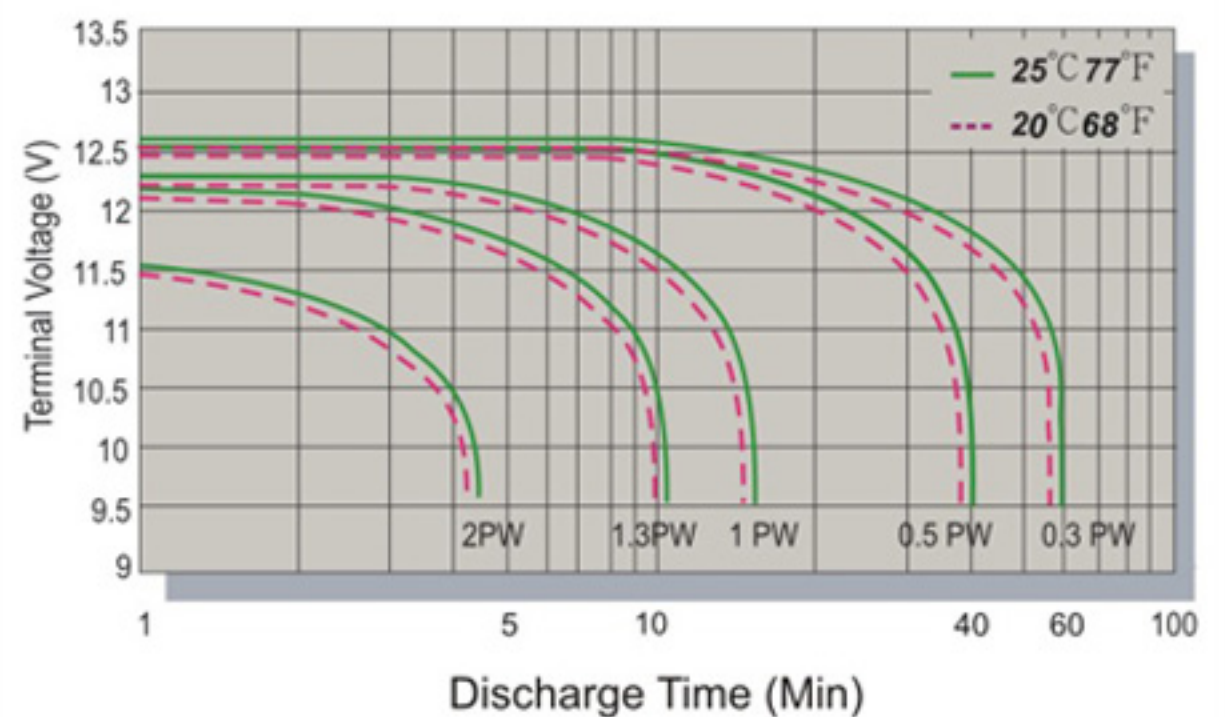
Cycle Service Life



Battery Voltage and Charge Time for Cycle Use



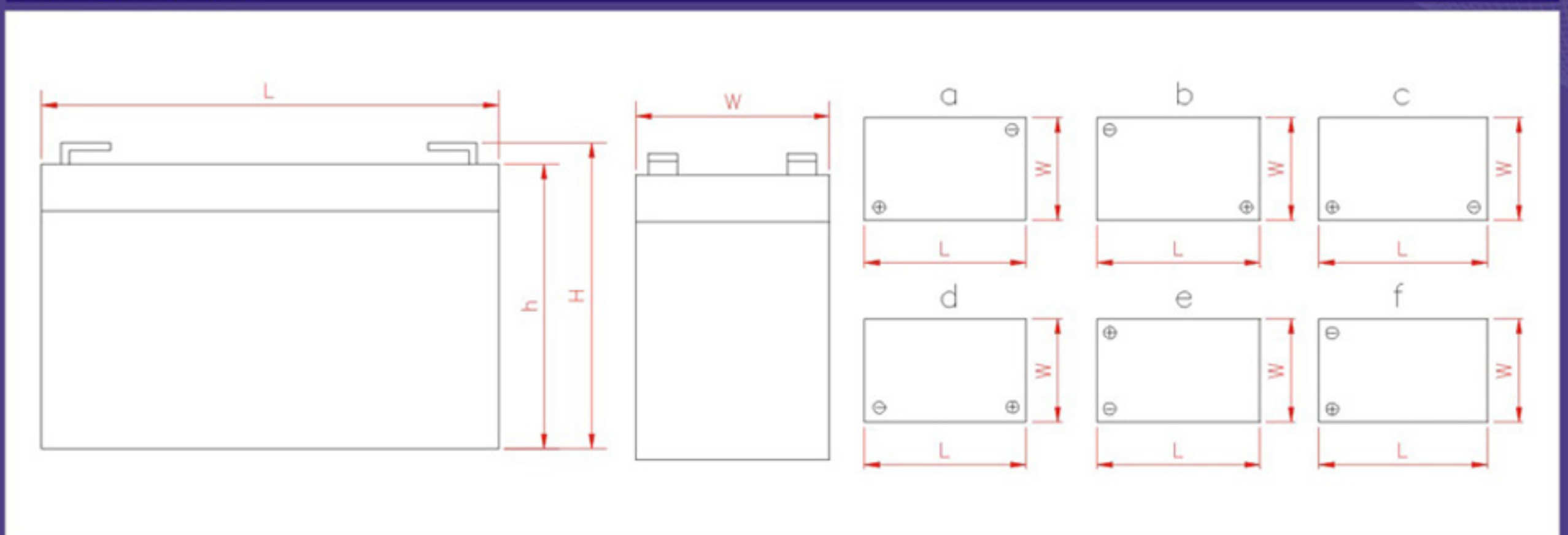
Terminal Voltage (V) and Discharge Time



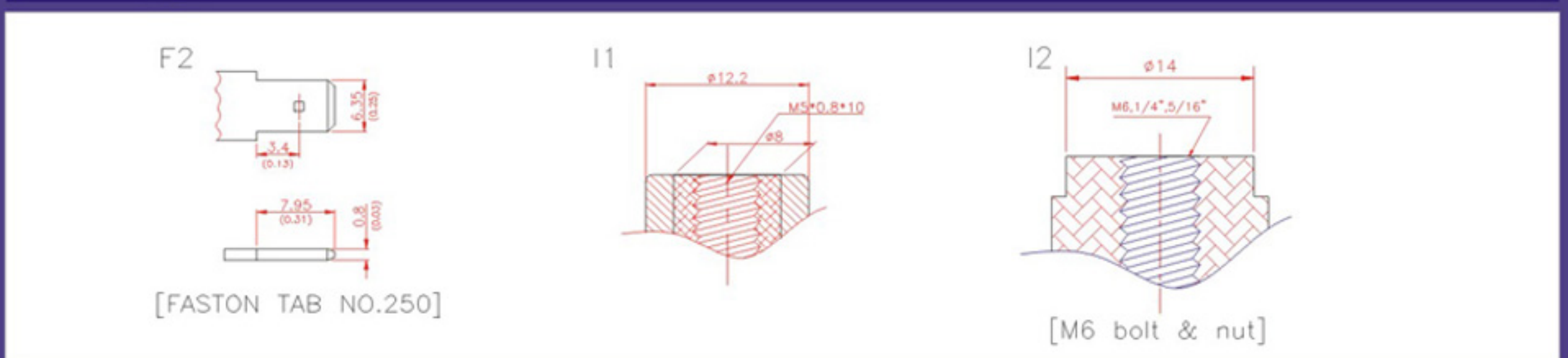
Specifications

| Battery Type | Nominal Voltage(V) | Nominal Capacity (15min) (w/cell) | Weight (Approx. kg) | Energy Density (wh/L) | Specific Energy (wh/kg) | Internal Resistance Approx. (mΩ) | Max. Discharge Current 5 sec (A) | Dimensions (mm) | | | | Terminal Position | Terminal Type | Max. Charging Current (A) | Charging(V) | |
|--------------|--------------------|-----------------------------------|---------------------|-----------------------|-------------------------|----------------------------------|----------------------------------|--------------------|----------------------|------------|-----------|-------------------|---------------|---------------------------|--|---|
| | | | | | | | | Overall Height (H) | Container Height (h) | Length (L) | Width (W) | | | | Standby Use | Cycle Use |
| HRL634W | 6 | 34 | 1.32 | 52.8 | 19.32 | 10.00 | 130 | 98.3±1.0 | 94.0±1.0 | 151.0±2.0 | 34.0±1.0 | c | F2 | 3.40 | 2.275V±0.025/CELL AT 25°C (77°F) Temp Coefficient -3.3mV/CELL°C | 2.45V±0.05V/CELL AT 25°C (77°F) Temp Coefficient -5mV/CELL°C |
| HRL1210W | 12 | 10 | 1.10 | 38.7 | 13.64 | 35.00 | 40 | 70.0±1.0 | 64.0±1.0 | 178.0±2.0 | 34.0±1.0 | c | F2 | 1.00 | | |
| HRL1223W | 12 | 23 | 2.10 | 53.8 | 16.43 | 19.00 | 130 | 106.0±1.5 | 101.8±1.5 | 90.0±1.0 | 70.0±1.0 | c | F2 | 2.30 | | |
| HRL1234W | 12 | 34 | 2.56 | 55.3 | 19.92 | 17.00 | 130 | 98.3±1.0 | 94.0±1.0 | 151.0±2.0 | 65.0±1.0 | e | F2 | 3.40 | | |
| HRL1280W | 12 | 80 | 6.50 | 54.4 | 18.46 | 9.00 | 300 | 167.0±2.0 | 160.0±2.0 | 181.0±2.0 | 76.2±1.0 | d | I1 | 8.00 | | |
| HRL12110W | 12 | 110 | 9.90 | 48.0 | 16.67 | 9.00 | 400 | 175.0±2.0 | 165.5 | 166.0±2.0 | 125.0±1.5 | c | I1 | 11.00 | | |
| HRL12150W | 12 | 150 | 11.75 | 59.6 | 19.15 | 7.00 | 225 | 172.0±2.0 | 148.5±2.0 | 195.6±2.0 | 130.0±1.5 | c | I2 | 15.00 | | |
| HRL12200W | 12 | 200 | 17.60 | 47.0 | 17.05 | 5.70 | 300 | 207.3±2.5 | 202.3±2.5 | 228.0±2.5 | 138.4±1.5 | c | I2 | 20.00 | | |
| HRL12280W | 12 | 280 | 25.80 | 45.2 | 16.28 | 4.00 | 800 | 214.2±2.5 | 211.2±2.5 | 261.0±2.5 | 168.5±2.0 | c | I2 | 28.00 | | |
| HRL12330W | 12 | 330 | 29.60 | 44.9 | 16.72 | 4.00 | 800 | 214.3±2.5 | 211.3±2.5 | 308.7±2.5 | 169.0±2.0 | c | I2 | 33.00 | | |
| HRL12390W | 12 | 390 | 33.00 | 46.9 | 17.73 | 4.00 | 800 | 217.6±2.5 | 214.6±2.5 | 342.0±2.5 | 170.0±2.0 | c | I2 | 39.00 | | |
| HRL12500W | 12 | 500 | 45.70 | 46.8 | 16.41 | 3.70 | 800 | 277.7±2.5 | 274.7±2.5 | 343.0±2.5 | 170.0±2.0 | c | I2 | 50.00 | | |

Terminal Position



Terminal Type



HRL634W

Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 60.4 | 47.4 | 37.6 | 30.9 | 26.6 | 18.7 | 14.4 | 10.3 | 5.84 | 4.66 |
| 1.67V | 56.5 | 44.4 | 35.4 | 29.3 | 25.2 | 18.6 | 14.3 | 10.2 | 5.80 | 4.63 |
| 1.70V | 54.9 | 43.1 | 34.2 | 28.6 | 24.6 | 18.5 | 14.2 | 10.1 | 5.78 | 4.62 |
| 1.75V | 51.9 | 40.7 | 32.3 | 27.0 | 23.8 | 18.3 | 14.1 | 10.0 | 5.74 | 4.57 |
| 1.80V | 48.9 | 37.9 | 30.6 | 25.8 | 23.0 | 18.1 | 13.9 | 9.94 | 5.69 | 4.52 |
| 1.85V | 45.4 | 35.1 | 28.6 | 24.6 | 22.0 | 17.9 | 13.8 | 9.84 | 5.65 | 4.47 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 327 | 260 | 209 | 175 | 150 | 110 | 84.0 | 60.7 | 34.6 | 27.7 |
| 1.67V | 312 | 246 | 197 | 167 | 143 | 109 | 82.6 | 60.3 | 34.5 | 27.6 |
| 1.70V | 305 | 240 | 192 | 163 | 140 | 108 | 82.0 | 59.7 | 34.4 | 27.5 |
| 1.75V | 292 | 228 | 183 | 155 | 135 | 104 | 81.0 | 59.3 | 34.2 | 27.3 |
| 1.80V | 278 | 215 | 173 | 147 | 129 | 100 | 80.0 | 58.9 | 33.9 | 27.1 |
| 1.85V | 265 | 203 | 164 | 139 | 123 | 96.0 | 79.0 | 58.1 | 33.7 | 26.9 |

HRL1210W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 19.2 | 13.7 | 10.5 | 8.84 | 7.47 | 5.51 | 4.24 | 3.06 | 1.66 | 1.29 |
| 1.67V | 18.3 | 13.3 | 10.2 | 8.70 | 7.37 | 5.43 | 4.20 | 3.03 | 1.64 | 1.28 |
| 1.70V | 17.9 | 13.0 | 10.1 | 8.64 | 7.32 | 5.39 | 4.18 | 3.02 | 1.63 | 1.27 |
| 1.75V | 17.1 | 12.5 | 9.85 | 8.37 | 7.15 | 5.27 | 4.10 | 2.98 | 1.62 | 1.26 |
| 1.80V | 16.3 | 11.8 | 9.50 | 8.10 | 6.98 | 5.14 | 4.02 | 2.93 | 1.60 | 1.25 |
| 1.85V | 15.6 | 11.1 | 9.15 | 7.83 | 6.81 | 5.02 | 3.94 | 2.89 | 1.59 | 1.24 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 200 | 147 | 113 | 95.6 | 81.5 | 60.9 | 47.0 | 34.1 | 18.7 | 14.7 |
| 1.67V | 193 | 143 | 110 | 94.0 | 80.5 | 60.0 | 46.5 | 34.0 | 18.6 | 14.6 |
| 1.70V | 189 | 140 | 108 | 92.9 | 79.8 | 59.3 | 46.3 | 33.9 | 18.5 | 14.5 |
| 1.75V | 182 | 134 | 106 | 91.0 | 78.9 | 58.5 | 46.0 | 33.5 | 18.4 | 14.4 |
| 1.80V | 175 | 128 | 103 | 89.1 | 77.3 | 57.2 | 45.2 | 33.0 | 18.2 | 14.3 |
| 1.85V | 169 | 121 | 100 | 86.6 | 75.8 | 55.8 | 44.5 | 32.6 | 18.1 | 14.2 |

HRL1223W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 48.2 | 34.8 | 28.3 | 23.2 | 19.5 | 14.0 | 11.2 | 8.28 | 4.40 | 3.22 |
| 1.67V | 44.9 | 32.7 | 27.0 | 22.1 | 18.7 | 13.6 | 11.0 | 8.05 | 4.26 | 3.10 |
| 1.70V | 43.5 | 31.9 | 26.2 | 21.7 | 18.3 | 13.3 | 10.8 | 7.88 | 4.20 | 3.05 |
| 1.75V | 41.3 | 30.4 | 25.2 | 20.9 | 17.6 | 12.9 | 10.7 | 7.87 | 4.18 | 2.95 |
| 1.80V | 39.1 | 28.9 | 24.0 | 20.2 | 17.1 | 12.5 | 10.5 | 7.85 | 4.16 | 2.85 |
| 1.85V | 36.9 | 27.4 | 22.9 | 19.4 | 16.4 | 12.1 | 10.3 | 7.84 | 4.14 | 2.75 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 540 | 390 | 317 | 260 | 218 | 161 | 132 | 99.1 | 51.9 | 38.0 |
| 1.67V | 503 | 367 | 302 | 247 | 209 | 156 | 128 | 95.0 | 50.3 | 36.6 |
| 1.70V | 489 | 357 | 294 | 242 | 205 | 152 | 126 | 93.0 | 49.6 | 36.0 |
| 1.75V | 463 | 341 | 281 | 234 | 197 | 147 | 123 | 92.8 | 49.4 | 34.8 |
| 1.80V | 438 | 324 | 271 | 227 | 192 | 143 | 121 | 92.4 | 49.1 | 33.6 |
| 1.85V | 413 | 307 | 260 | 218 | 186 | 139 | 119 | 91.8 | 48.9 | 32.5 |

HRL1234W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 66.0 | 45.0 | 34.5 | 28.0 | 24.0 | 17.6 | 14.0 | 10.1 | 5.69 | 4.00 |
| 1.67V | 58.0 | 41.0 | 32.3 | 27.1 | 23.5 | 17.4 | 13.8 | 9.90 | 5.61 | 3.96 |
| 1.70V | 54.4 | 39.1 | 31.3 | 26.4 | 23.1 | 17.2 | 13.7 | 9.83 | 5.57 | 3.93 |
| 1.75V | 48.5 | 35.9 | 29.4 | 25.0 | 22.1 | 16.8 | 13.4 | 9.68 | 5.50 | 3.87 |
| 1.80V | 42.5 | 32.8 | 27.0 | 23.2 | 20.6 | 15.8 | 12.8 | 9.33 | 5.36 | 3.80 |
| 1.85V | 36.6 | 29.6 | 24.6 | 21.1 | 18.8 | 14.4 | 11.7 | 8.71 | 5.06 | 3.62 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 643 | 465 | 375 | 306 | 265 | 205 | 159 | 115 | 65.9 | 46.7 |
| 1.67V | 581 | 435 | 354 | 299 | 262 | 204 | 158 | 114 | 65.4 | 46.6 |
| 1.70V | 550 | 419 | 342 | 293 | 259 | 202 | 155 | 111 | 64.6 | 46.4 |
| 1.75V | 503 | 393 | 324 | 280 | 251 | 198 | 152 | 109 | 63.9 | 46.0 |
| 1.80V | 456 | 367 | 307 | 266 | 238 | 189 | 147 | 108 | 62.9 | 45.1 |
| 1.85V | 409 | 341 | 284 | 246 | 217 | 174 | 137 | 102 | 60.2 | 43.4 |

HRL1280W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 165 | 113 | 87.9 | 72.3 | 62.4 | 44.4 | 35.0 | 24.9 | 14.6 | 10.6 |
| 1.67V | 142 | 103 | 81.7 | 69.5 | 58.7 | 43.5 | 34.0 | 24.6 | 14.4 | 10.4 |
| 1.70V | 133 | 98.6 | 80.7 | 67.8 | 58.1 | 42.4 | 33.7 | 24.3 | 14.2 | 10.2 |
| 1.75V | 119 | 92.3 | 75.5 | 64.3 | 54.3 | 41.6 | 32.9 | 23.7 | 14.0 | 10.1 |
| 1.80V | 105 | 83.2 | 70.0 | 60.8 | 51.8 | 39.8 | 32.1 | 23.0 | 13.6 | 10.0 |
| 1.85V | 92.3 | 76.6 | 65.2 | 56.8 | 49.2 | 37.6 | 30.1 | 22.1 | 13.5 | 9.84 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|-------|-------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 1,584 | 1,171 | 955 | 790 | 691 | 496 | 391 | 282 | 169 | 122 |
| 1.67V | 1,431 | 1,073 | 895 | 761 | 661 | 485 | 382 | 280 | 167 | 121 |
| 1.70V | 1,369 | 1,045 | 884 | 743 | 660 | 475 | 381 | 275 | 165 | 118 |
| 1.75V | 1,270 | 983 | 832 | 708 | 626 | 468 | 370 | 270 | 161 | 117 |
| 1.80V | 1,173 | 909 | 781 | 679 | 593 | 453 | 364 | 266 | 159 | 116 |
| 1.85V | 1,091 | 855 | 734 | 641 | 561 | 426 | 346 | 257 | 156 | 115 |

HRL12110W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1.60V | 170 | 145 | 118 | 97.5 | 81.6 | 61.4 | 48.0 | 33.6 | 21.3 | 14.9 |
| 1.67V | 151 | 129 | 108 | 91.1 | 77.5 | 59.6 | 47.0 | 33.2 | 20.8 | 14.7 |
| 1.70V | 141 | 121 | 103 | 88.3 | 75.7 | 58.6 | 46.3 | 32.7 | 20.4 | 14.5 |
| 1.75V | 125 | 108 | 93.2 | 82.7 | 72.2 | 56.1 | 44.7 | 32.3 | 20.0 | 14.4 |
| 1.80V | 109 | 94.0 | 83.7 | 76.4 | 68.7 | 53.7 | 42.5 | 31.9 | 19.6 | 14.2 |
| 1.85V | 89.3 | 78.7 | 73.6 | 69.2 | 64.4 | 51.0 | 40.8 | 29.7 | 18.3 | 14.0 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 2MIN | 4MIN | 6MIN | 8MIN | 10MIN | 15MIN | 20MIN | 30MIN | 60MIN | 90MIN |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 1,806 | 1,541 | 1,270 | 1,053 | 888 | 682 | 554 | 385 | 247 | 174 |
| 1.67V | 1,624 | 1,386 | 1,171 | 988 | 852 | 665 | 535 | 377 | 243 | 173 |
| 1.70V | 1,530 | 1,316 | 1,107 | 956 | 827 | 655 | 526 | 372 | 239 | 171 |
| 1.75V | 1,358 | 1,190 | 1,020 | 900 | 796 | 636 | 510 | 361 | 234 | 170 |
| 1.80V | 1,177 | 1,054 | 941 | 851 | 764 | 610 | 495 | 352 | 229 | 168 |
| 1.85V | 995 | 918 | 854 | 793 | 733 | 589 | 478 | 337 | 217 | 167 |

HRL12150W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 5MIN | 7.5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 50MIN | 60MIN | 90MIN |
|----------|------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 169 | 138 | 116 | 86.7 | 69.6 | 50.4 | 40.0 | 33.5 | 28.9 | 20.8 |
| 1.67V | 152 | 127 | 107 | 82.2 | 66.3 | 48.4 | 38.7 | 32.5 | 28.6 | 20.5 |
| 1.70V | 144 | 122 | 103 | 80.0 | 64.7 | 47.5 | 38.0 | 32.1 | 28.4 | 20.4 |
| 1.75V | 132 | 112 | 96.8 | 76.0 | 62.0 | 45.7 | 36.8 | 30.9 | 27.8 | 20.0 |
| 1.80V | 119 | 104 | 90.0 | 71.1 | 58.4 | 43.8 | 35.1 | 29.8 | 26.8 | 19.5 |
| 1.85V | 107 | 94.1 | 82.8 | 67.0 | 55.1 | 41.7 | 33.6 | 28.6 | 25.0 | 18.6 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 5MIN | 7.5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 50MIN | 60MIN | 90MIN |
|----------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 1,794 | 1,479 | 1,263 | 968 | 788 | 577 | 463 | 387 | 335 | 244 |
| 1.67V | 1,624 | 1,370 | 1,182 | 935 | 753 | 559 | 451 | 386 | 334 | 239 |
| 1.70V | 1,549 | 1,322 | 1,143 | 916 | 737 | 548 | 442 | 382 | 332 | 236 |
| 1.75V | 1,422 | 1,234 | 1,075 | 877 | 704 | 530 | 428 | 374 | 325 | 231 |
| 1.80V | 1,302 | 1,143 | 1,006 | 825 | 675 | 507 | 410 | 361 | 314 | 226 |
| 1.85V | 1,188 | 1,057 | 943 | 773 | 639 | 486 | 396 | 337 | 296 | 222 |

HRL12200W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 5MIN | 7.5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 50MIN | 60MIN | 90MIN |
|----------|------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 225 | 184 | 155 | 116 | 92.7 | 67.2 | 53.4 | 44.6 | 38.5 | 27.7 |
| 1.67V | 205 | 169 | 144 | 110 | 89.4 | 64.7 | 52.0 | 44.3 | 38.1 | 27.4 |
| 1.70V | 195 | 163 | 138 | 108 | 87.6 | 63.6 | 51.1 | 43.9 | 37.8 | 27.3 |
| 1.75V | 177 | 150 | 128 | 103 | 83.6 | 61.2 | 49.5 | 42.8 | 37.0 | 26.7 |
| 1.80V | 159 | 138 | 119 | 95.7 | 79.0 | 58.7 | 47.4 | 41.0 | 35.7 | 26.0 |
| 1.85V | 142 | 125 | 110 | 89.3 | 73.4 | 55.6 | 44.8 | 38.1 | 33.3 | 24.8 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 5MIN | 7.5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 50MIN | 60MIN | 90MIN |
|----------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 2,392 | 1,972 | 1,684 | 1,290 | 1,050 | 770 | 618 | 516 | 447 | 325 |
| 1.67V | 2,176 | 1,842 | 1,589 | 1,235 | 1,010 | 748 | 612 | 514 | 445 | 323 |
| 1.70V | 2,081 | 1,774 | 1,540 | 1,208 | 988 | 737 | 607 | 510 | 443 | 322 |
| 1.75V | 1,914 | 1,648 | 1,449 | 1,160 | 945 | 710 | 594 | 499 | 434 | 315 |
| 1.80V | 1,747 | 1,526 | 1,359 | 1,093 | 900 | 683 | 568 | 481 | 419 | 308 |
| 1.85V | 1,584 | 1,410 | 1,258 | 1,031 | 852 | 649 | 528 | 450 | 395 | 295 |

HRL12280W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 45MIN | 50MIN | 60MIN | 90MIN |
|----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 318 | 216 | 167 | 137 | 103 | 82.6 | 76.0 | 70.1 | 59.9 | 44.6 |
| 1.67V | 283 | 200 | 155 | 128 | 98.3 | 79.9 | 72.9 | 67.1 | 57.7 | 42.1 |
| 1.70V | 266 | 192 | 149 | 124 | 96.3 | 78.1 | 71.2 | 65.4 | 55.6 | 40.6 |
| 1.75V | 236 | 175 | 141 | 117 | 91.3 | 75.9 | 68.5 | 63.5 | 53.8 | 38.5 |
| 1.80V | 207 | 161 | 131 | 111 | 85.4 | 70.5 | 63.7 | 58.8 | 50.1 | 36.3 |
| 1.85V | 178 | 145 | 122 | 105 | 81.3 | 65.8 | 59.7 | 55.1 | 47.3 | 34.7 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 45MIN | 50MIN | 60MIN | 90MIN |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 3,354 | 2,304 | 1,788 | 1,476 | 1,110 | 888 | 822 | 762 | 648 | 485 |
| 1.67V | 3,036 | 2,166 | 1,700 | 1,417 | 1,079 | 876 | 804 | 738 | 636 | 466 |
| 1.70V | 2,880 | 2,100 | 1,643 | 1,384 | 1,060 | 864 | 792 | 726 | 618 | 454 |
| 1.75V | 2,615 | 1,955 | 1,575 | 1,326 | 1,023 | 834 | 780 | 703 | 600 | 436 |
| 1.80V | 2,329 | 1,800 | 1,493 | 1,274 | 980 | 802 | 738 | 678 | 581 | 422 |
| 1.85V | 2,016 | 1,656 | 1,408 | 1,212 | 938 | 760 | 694 | 636 | 550 | 404 |

HRL12330W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 45MIN | 50MIN | 60MIN | 90MIN |
|----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 383 | 260 | 201 | 165 | 123 | 98.4 | 89.9 | 82.0 | 70.2 | 52.1 |
| 1.67V | 339 | 239 | 188 | 157 | 117 | 94.2 | 85.3 | 78.1 | 67.1 | 49.4 |
| 1.70V | 318 | 229 | 181 | 152 | 113 | 91.1 | 83.4 | 76.4 | 64.9 | 47.3 |
| 1.75V | 284 | 210 | 168 | 144 | 106 | 85.6 | 78.9 | 72.5 | 61.2 | 44.4 |
| 1.80V | 253 | 193 | 158 | 135 | 98.4 | 79.6 | 72.5 | 66.4 | 56.6 | 41.6 |
| 1.85V | 219 | 177 | 147 | 125 | 92.5 | 74.9 | 68.5 | 62.5 | 53.5 | 39.5 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 45MIN | 50MIN | 60MIN | 90MIN |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 4,044 | 2,772 | 2,148 | 1,770 | 1,320 | 1,062 | 972 | 888 | 762 | 566 |
| 1.67V | 3,621 | 2,608 | 2,040 | 1,712 | 1,290 | 1,032 | 936 | 864 | 744 | 547 |
| 1.70V | 3,438 | 2,520 | 1,979 | 1,679 | 1,266 | 1,008 | 924 | 852 | 726 | 529 |
| 1.75V | 3,115 | 2,354 | 1,891 | 1,605 | 1,210 | 963 | 894 | 816 | 696 | 503 |
| 1.80V | 2,791 | 2,180 | 1,795 | 1,528 | 1,145 | 918 | 833 | 762 | 650 | 484 |
| 1.85V | 2,478 | 2,016 | 1,690 | 1,428 | 1,070 | 864 | 786 | 720 | 613 | 460 |

HRL12390W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 45MIN | 50MIN | 60MIN | 90MIN |
|----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 443 | 308 | 236 | 191 | 142 | 112 | 102 | 93.5 | 78.8 | 58.0 |
| 1.67V | 398 | 285 | 223 | 182 | 134 | 108 | 97.1 | 88.8 | 75.1 | 54.1 |
| 1.70V | 376 | 274 | 215 | 177 | 130 | 105 | 94.6 | 86.4 | 72.2 | 51.4 |
| 1.75V | 336 | 254 | 203 | 167 | 122 | 99.3 | 90.8 | 82.2 | 69.2 | 49.1 |
| 1.80V | 295 | 232 | 187 | 154 | 114 | 92.2 | 83.8 | 76.4 | 64.7 | 45.6 |
| 1.85V | 254 | 210 | 171 | 141 | 105 | 85.8 | 78.2 | 71.6 | 60.7 | 43.4 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 45MIN | 50MIN | 60MIN | 90MIN |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 4,674 | 3,276 | 2,526 | 2,052 | 1,524 | 1,206 | 1,098 | 1,014 | 858 | 630 |
| 1.67V | 4,226 | 3,051 | 2,388 | 1,956 | 1,471 | 1,182 | 1,068 | 978 | 820 | 600 |
| 1.70V | 4,000 | 2,945 | 2,330 | 1,910 | 1,440 | 1,164 | 1,050 | 960 | 804 | 574 |
| 1.75V | 3,615 | 2,770 | 2,217 | 1,809 | 1,380 | 1,117 | 1,013 | 936 | 776 | 556 |
| 1.80V | 3,226 | 2,600 | 2,090 | 1,708 | 1,296 | 1,062 | 964 | 882 | 746 | 530 |
| 1.85V | 2,868 | 2,404 | 1,957 | 1,614 | 1,213 | 990 | 902 | 828 | 708 | 505 |

HRL12500W**Constant Current Discharge Characteristics Unit:Amperes(25°C, 77°F)**

| F.V/Time | 5MIN | 7.5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 50MIN | 60MIN | 90MIN |
|----------|------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 491 | 444 | 388 | 294 | 235 | 172 | 136 | 112 | 95.7 | 67.2 |
| 1.67V | 449 | 405 | 356 | 278 | 223 | 164 | 134 | 110 | 94.3 | 66.1 |
| 1.70V | 425 | 386 | 340 | 270 | 217 | 161 | 133 | 109 | 93.5 | 65.4 |
| 1.75V | 388 | 348 | 310 | 253 | 206 | 155 | 130 | 107 | 91.1 | 64.5 |
| 1.80V | 348 | 309 | 278 | 233 | 194 | 147 | 123 | 102 | 87.3 | 62.0 |
| 1.85V | 304 | 270 | 247 | 211 | 179 | 140 | 115 | 95.3 | 81.1 | 57.3 |

Constant Power Discharge Characteristics Unit:Watts(25°C, 77°F)

| F.V/Time | 5MIN | 7.5MIN | 10MIN | 15MIN | 20MIN | 30MIN | 40MIN | 50MIN | 60MIN | 90MIN |
|----------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.60V | 5,275 | 4,691 | 4,167 | 3,181 | 2,594 | 1,951 | 1,558 | 1,292 | 1,112 | 783 |
| 1.67V | 4,880 | 4,300 | 3,790 | 3,018 | 2,490 | 1,871 | 1,520 | 1,276 | 1,091 | 769 |
| 1.70V | 4,640 | 4,110 | 3,610 | 2,932 | 2,422 | 1,829 | 1,507 | 1,258 | 1,083 | 763 |
| 1.75V | 4,250 | 3,750 | 3,290 | 2,748 | 2,309 | 1,740 | 1,466 | 1,237 | 1,066 | 754 |
| 1.80V | 3,830 | 3,340 | 2,950 | 2,497 | 2,138 | 1,657 | 1,390 | 1,186 | 1,025 | 731 |
| 1.85V | 3,366 | 2,882 | 2,600 | 2,203 | 1,964 | 1,564 | 1,321 | 1,130 | 977 | 695 |

All information are suggest to change without notification. Please consult CSB website (www.csb-battery.com) for latest information.



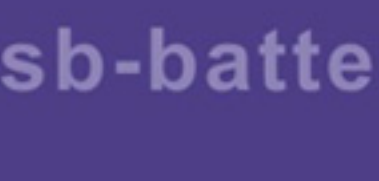
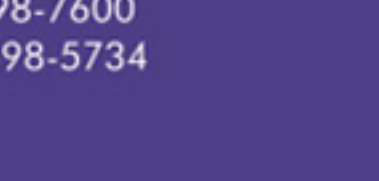
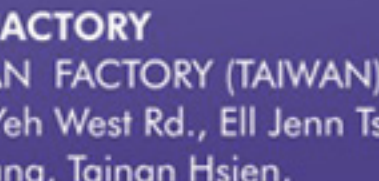
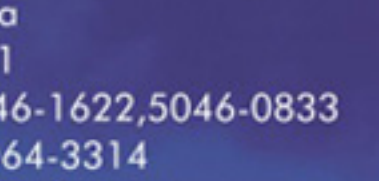
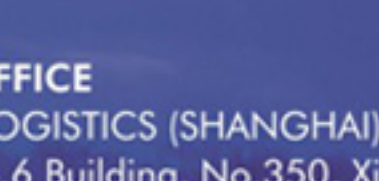
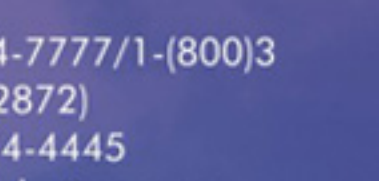
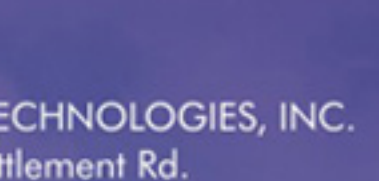
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