

VISION
Rechargeable Products
Lead-Acid Battery



www.vision-batt.com



FM Series
General Purpose Applications

One of the largest Sealed Lead Acid Battery manufacturers in the world



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Shenzhen Center Power Tech. Co., Ltd



Products Guide

General purpose application batteries

Principle of VRLA batteries

VISION FM series are designed for general-purpose applications, such as UPS, telecom, and electrical utilities. With 10 years design life, the batteries comply to the most popular international standards, such as IEC60896-21/22, BS6290-4, Eurobat Guide. The battery container and cover are available both in V0 class flame retardant ABS or HBO ABS plastics. With more than 15 years of production experience, VISION FM series of VRLA batteries are recognized as the most reliable and high quality battery system in the industry.

General Specifications

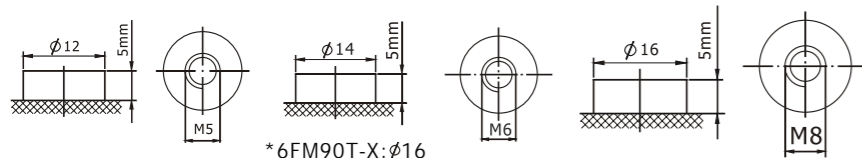
| TYPE | Nominal Voltage(V) | Capacity(Ah) 1.8Vpc@10hr,25°C | Capacity(Ah) 1.75Vpc@20hr,25°C | L(mm) | L(inch) | W(mm) | W(inch) | H(mm) | H(inch) | TH(mm) | TH(inch) | Terminal | Layout | Wt.(Kg) | Wt.(lbs) |
|-----------|--------------------|----------------------------------|-----------------------------------|-------|---------|-------|---------|-------|---------|--------|----------|----------|--------|---------|----------|
| 6FM17-X | 12 | 17 | 18.2 | 181 | 7.13 | 77 | 3.03 | 167 | 6.57 | 167 | 6.57 | M5 | B | 5.7 | 12.6 |
| 6FM24-X | 12 | 24 | 25.2 | 166 | 6.54 | 175 | 6.89 | 125 | 4.92 | 125 | 4.92 | M5 | B | 8.6 | 19.0 |
| 6FM33-X | 12 | 33 | 35.6 | 195 | 7.68 | 130 | 5.12 | 155 | 6.10 | 168 | 6.61 | M6 | A | 10.2 | 22.5 |
| 6FM40-X | 12 | 40 | 43.0 | 197 | 7.76 | 165 | 6.50 | 170 | 6.69 | 170 | 6.69 | M6 | B | 13.5 | 29.8 |
| 6FM45-X | 12 | 45 | 47.4 | 197 | 7.76 | 165 | 6.50 | 170 | 6.69 | 170 | 6.69 | M6 | B | 13.8 | 30.4 |
| 6FM55SG-X | 12 | 55 | 57.2 | 229 | 9.02 | 138 | 5.43 | 208 | 8.19 | 213 | 8.39 | M6 | A | 19.5 | 43.0 |
| 6FM60-X | 12 | 60 | 65.8 | 258 | 10.2 | 166 | 6.54 | 206 | 8.11 | 215 | 8.46 | M6 | A | 24.0 | 52.9 |
| 6FM65-X | 12 | 65 | 70.0 | 350 | 13.8 | 167 | 6.57 | 179 | 7.05 | 179 | 7.05 | M6 | A | 23.4 | 51.6 |
| 6FM75-X | 12 | 75 | 81.0 | 258 | 10.2 | 166 | 6.54 | 206 | 8.11 | 215 | 8.46 | M6 | A | 23.4 | 51.6 |
| 6FM80-X | 12 | 80 | 85.2 | 350 | 13.8 | 167 | 6.57 | 179 | 7.05 | 179 | 7.05 | M6 | A | 24.0 | 52.9 |
| 6FM90T-X | 12 | 90 | 97.6 | 306 | 12.0 | 169 | 6.65 | 210 | 8.27 | 215 | 8.46 | M6 | A | 30.0 | 66.2 |
| 6FM100-X | 12 | 100 | 107 | 330 | 13.0 | 171 | 6.73 | 215 | 8.46 | 222 | 8.74 | M6 | A | 32.0 | 70.6 |
| 6FM120-X | 12 | 120 | 126 | 410 | 16.1 | 176 | 6.93 | 227 | 8.94 | 227 | 8.94 | M8 | A | 38.0 | 83.8 |
| 6FM134-X | 12 | 134 | 144 | 341 | 13.4 | 173 | 6.81 | 283 | 11.1 | 287 | 11.3 | M8 | A | 42.5 | 93.7 |
| 6FM150-X | 12 | 150 | 162 | 485 | 19.1 | 172 | 6.77 | 240 | 9.45 | 240 | 9.45 | M8 | A | 47.0 | 104 |
| 6FM175 | 12 | 175 | 185 | 533 | 21.0 | 207 | 8.15 | 215 | 8.47 | 240 | 9.45 | M10 | C | 56.4 | 124 |
| 6FM200-X | 12 | 200 | 216 | 522 | 20.6 | 238 | 9.37 | 218 | 8.58 | 223 | 8.78 | M8 | C | 65.0 | 143 |
| 6FM230-X | 12 | 230 | 243 | 520 | 20.5 | 269 | 10.6 | 203 | 8.00 | 208 | 8.19 | M8 | C | 72.6 | 160.1 |
| 3FM225-X | 6 | 225 | 234 | 320 | 12.6 | 176 | 6.93 | 225 | 8.86 | 247 | 9.72 | M8 | D | 30.5 | 67.3 |

More battery types are available on website: <http://www.vision-batt.com>

Position of terminals



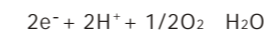
Terminal



*6FM90T-X: φ16

During conventional lead Acid battery charging, water electrolysis occurs at the final stage, then (so) hydrogen generates from the negative plates and oxygen from the positive plates. This causes water loss and periodic watering is needed.

However, evolution of oxygen and hydrogen gases does not occur simultaneously, because the recharge of the positive plates is not as efficient as the negative ones. This means that oxygen is evolved from the positive plate before hydrogen is evolved from the negative plate. At the same time that oxygen is evolved from the positive plate, a substantial amount of highly active spongy lead exists on the negative plate before it commences hydrogen evolution. Therefore, providing oxygen can be transported to the negative plates, conditions are ideal for a rapid reaction between lead and oxygen, i.e. oxygen is electrochemically reduced on the negative plate according to the following formula,

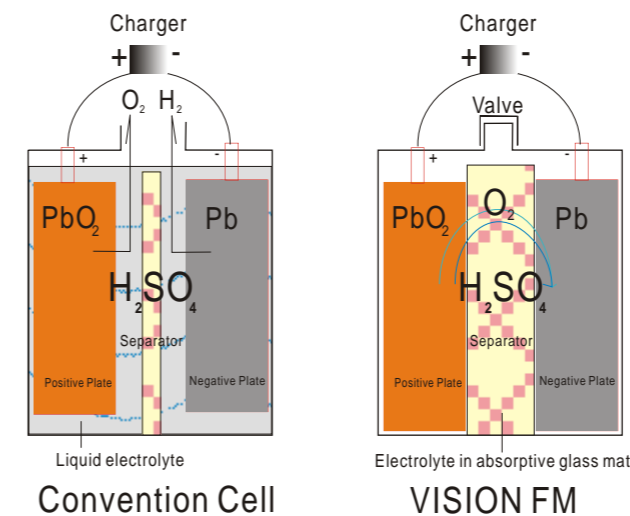


and the final product is water.

The current flowing through the negative plate drives this reaction instead of hydrogen evolution, which occurs, in a conventional battery.

This process is called gas recombination. If this process were 100% efficient no water would be lost from the battery. By careful design and selection of battery components, gas recombination efficiency is from 95% to 99%.

Principle of the oxygen reduction cycle



Recombination efficiency
Recombination efficiency is determined under specific conditions by measuring the volume of hydrogen emitted from the battery and converting this into its ampere-hour equivalent. This equivalent value is then subtracted from the total ampere-hours taken by the battery during the test period, and the remainder is the battery's recombination efficiency and is usually expressed as a percentage.

As recombination is never 100%, some hydrogen gas is emitted from batteries through the safety valve. The volume of gas emitted is very small and typical average values on constant potential float at 25°C are as follows:

| VISION FM hydrogen emissions | |
|------------------------------|---------------------------------------------|
| Float Voltage (V/cell) | Volume of gas emitted (ml/cell/C10Ah/month) |
| 2.23~2.28 | 3.8 |
| 2.40~2.45 | 25 |

Conventional Cell
Oxygen and hydrogen escape to the atmosphere.
VISION FM
Oxygen from the positive plate transfers to the negative and recombines with lead to form water.

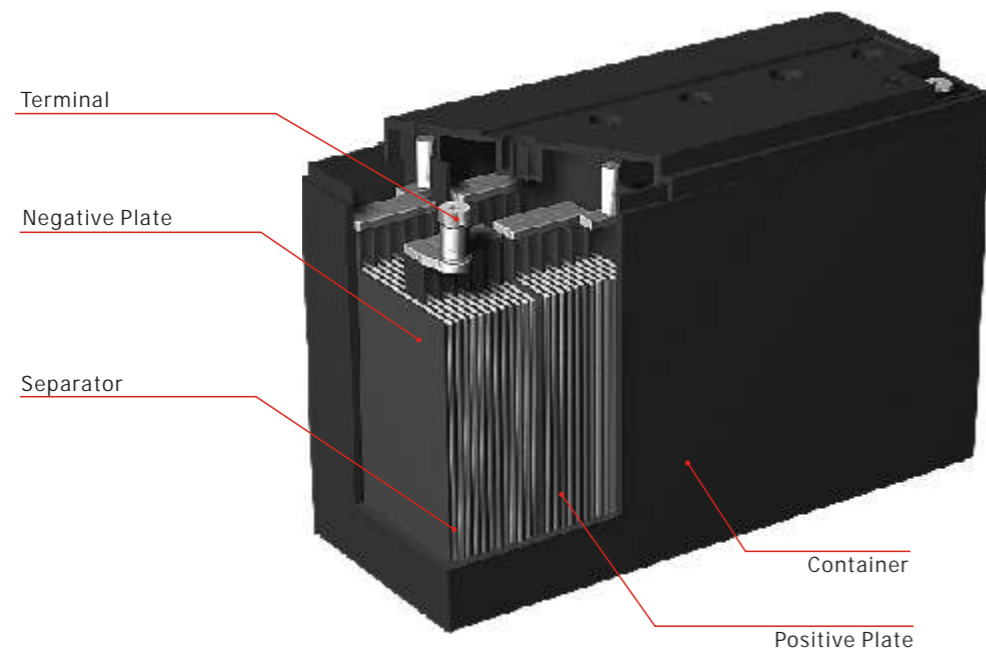
Charge characteristics

Construction :

These reactions can take place only by using :

- Plates composed of special alloy with several components which provide the plate grids with high mechanical strength and a high level of hydrogen over voltage.
- An appropriate ratio between positive and negative active materials.

- Fiberglass separators manufactured from borosilicate, giving them excellent resistance to high temperatures and to sulphuric acid. The high level of porosity of these separators is used to retain the quantity of electrolyte necessary for cell operation, but without any free electrolyte.
- A pressure relief valve which allows gas to be released if necessary in the case of an accidental overcharge.



The cells in the VISION FM product range must be charged at a constant voltage at an ambient temperature of 25°C, the batteries should be charged at 2.23-2.28 volts per cell. It is not necessary to limit the current, as this will be governed by the maximum output available from the charger until the voltage limit is reached. The charging voltage of 2.23-2.28 volts should also be used for float charging. To achieve nominal performance characteristics, it is recommended to adjust this value to suit the ambient temperature, as indicated in the following table:

| Temperature | Float charge voltage |
|-------------|----------------------|
| 0°C | 2.31 - 2.36 V |
| 10°C | 2.28 - 2.33 V |
| 20°C | 2.25 - 2.30 V |
| 25°C | 2.23 - 2.28 V |
| 30°C | 2.22 - 2.27 V |
| 35°C | 2.20 - 2.25 V |

Under these conditions a full recharge will be completed in approximately 48 hours.



Fast recharge:

Increasing the charge voltage to 2.40 Volts per cell can reduce recharge time and it is possible, depending on the depth of discharge, to halve the recharge time. Under these conditions, however, the charge must be monitored and must be terminated when the charge current remains reasonably steady for 3 hours after the voltage limit has been reached. At the beginning of charge the current must be limited to 0.3C₁₀ (A).

Ripple current:

The ripple content of the charging current affects the life of the battery. It is recommended to limit the continuous ripple current to 0.05 C₁₀ (in amperes) as recommended value (never exceed 0.10C₁₀). Transient and other ripple type voltage excursions can be accommodated provided that, with the battery disconnected, the system peak to peak voltage including regulation limits falls within ±2.5% of the recommended float voltage of the battery.

| Constant Current Discharge (Amperes) at 25°C to 1.60 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 67.0 | 45.3 | 35.6 | 27.8 | 23.1 | 20.0 | 17.7 | 16.0 | 14.7 | 13.6 | 12.7 | 12.0 | 8.41 | 6.61 | 5.54 | 4.82 | 3.80 | 3.18 | 2.73 | 2.41 | 2.17 | 1.98 | 1.83 | 1.56 | 0.82 |
| 6FM24-X | 85.0 | 60.0 | 46.0 | 37.0 | 32.0 | 27.9 | 24.5 | 22.0 | 20.2 | 18.5 | 17.3 | 15.8 | 11.5 | 9.40 | 7.75 | 6.76 | 5.40 | 4.45 | 3.90 | 3.45 | 3.10 | 2.80 | 2.56 | 2.16 | 1.20 |
| 6FM33-X | 115 | 80.2 | 61.5 | 49.3 | 41.9 | 37.0 | 32.7 | 29.4 | 26.9 | 25.1 | 23.6 | 22.3 | 15.7 | 12.4 | 10.4 | 9.08 | 7.34 | 6.30 | 5.32 | 4.62 | 4.10 | 3.69 | 3.36 | 2.86 | 1.54 |
| 6FM40-X | 131 | 93.0 | 73.3 | 57.6 | 48.3 | 42.0 | 37.4 | 34.0 | 31.3 | 29.1 | 27.4 | 25.9 | 18.3 | 14.5 | 12.2 | 10.7 | 8.60 | 7.36 | 6.33 | 5.60 | 5.05 | 4.62 | 4.28 | 3.61 | 1.87 |
| 6FM45-X | 149 | 100 | 77.8 | 61.8 | 52.1 | 45.7 | 41.1 | 37.7 | 35.0 | 32.2 | 29.9 | 28.0 | 19.9 | 15.9 | 13.4 | 11.8 | 9.30 | 7.80 | 6.73 | 5.96 | 5.39 | 4.94 | 4.58 | 3.89 | 2.04 |
| 6FM55SG-X | 175 | 129 | 99.4 | 79.3 | 67.2 | 59.2 | 52.3 | 47.1 | 43.1 | 39.9 | 37.3 | 35.1 | 24.9 | 19.7 | 16.7 | 14.6 | 11.6 | 9.82 | 8.43 | 7.44 | 6.69 | 6.11 | 5.65 | 4.78 | 2.45 |
| 6FM60-X | 202 | 129 | 115 | 91.0 | 76.6 | 67.0 | 59.8 | 54.5 | 50.3 | 46.6 | 43.6 | 41.0 | 28.9 | 22.8 | 19.1 | 16.7 | 13.4 | 11.4 | 9.80 | 8.66 | 7.80 | 7.13 | 6.60 | 5.61 | 3.10 |
| 6FM65-X | 149 | 100 | 77.8 | 65.0 | 55.0 | 47.5 | 43.0 | 39.0 | 35.0 | 32.5 | 30.0 | 28.0 | 21.0 | 16.6 | 14.0 | 12.1 | 9.80 | 8.15 | 6.90 | 6.40 | 5.70 | 5.10 | 4.66 | 4.00 | 2.10 |
| 6FM75-X | 240 | 178 | 137 | 109 | 92.9 | 81.8 | 73.2 | 66.7 | 61.7 | 57.1 | 53.4 | 50.2 | 36.0 | 28.9 | 24.6 | 21.8 | 17.1 | 14.3 | 12.1 | 10.5 | 9.33 | 8.41 | 7.67 | 6.54 | 3.52 |
| 6FM80-X | 247 | 188 | 149 | 118 | 99.6 | 87.3 | 78.3 | 71.5 | 66.2 | 61.2 | 57.1 | 53.7 | 38.2 | 30.5 | 25.8 | 22.7 | 17.9 | 15.0 | 12.8 | 11.1 | 9.91 | 8.96 | 8.20 | 6.90 | 3.72 |
| 6FM90T-X | | 218 | 173 | 137 | 115 | 100 | 89.2 | 81.0 | 74.7 | 69.6 | 65.5 | 62.0 | 44.5 | 35.8 | 30.5 | 27.0 | 20.9 | 17.2 | 14.6 | 12.7 | 11.3 | 10.2 | 9.30 | 7.91 | 4.26 |
| 6FM100-X | | 229 | 185 | 146 | 123 | 108 | 96.3 | 87.4 | 80.5 | 74.8 | 70.1 | 66.2 | 47.1 | 37.5 | 31.8 | 27.9 | 22.4 | 19.0 | 16.3 | 14.3 | 12.9 | 11.7 | 10.8 | 9.06 | 4.70 |
| 6FM120-X | | 250 | 196 | 158 | 135 | 120 | 106 | 95.8 | 87.7 | 81.3 | 76.0 | 71.6 | 51.8 | 41.9 | 36.0 | 32.0 | 25.1 | 21.0 | 18.2 | 16.2 | 14.6 | 13.4 | 12.5 | 10.5 | 5.54 |
| 6FM134-X | | 314 | 248 | 197 | 167 | 147 | 130 | 117 | 107 | 98.8 | 92.1 | 86.5 | 62.4 | 50.3 | 43.0 | 38.2 | 30.3 | 25.6 | 21.6 | 18.7 | 16.6 | 14.9 | 13.6 | 11.7 | 6.24 |
| 6FM150-X | | 360 | 288 | 228 | 193 | 169 | 149 | 135 | 123 | 115 | 108 | 102 | 73.3 | 58.9 | 50.3 | 44.5 | 34.7 | 28.8 | 24.4 | 21.2 | 18.8 | 17.0 | 15.5 | 13.2 | 7.10 |
| 6FM175 | | | 324 | 259 | 220 | 195 | 172 | 154 | 141 | 131 | 122 | 115 | 83.0 | 67.0 | 57.4 | 51.1 | 40.1 | 33.5 | 28.3 | 24.6 | 21.8 | 19.7 | 18.0 | 15.4 | 8.00 |
| 6FM200-X | | | 360 | 290 | 248 | 220 | 194 | 174 | 159 | 147 | 136 | 128 | 92.8 | 75.2 | 64.6 | 57.6 | 45.5 | 38.2 | 32.3 | 28.0 | 24.9 | 22.4 | 20.4 | 17.5 | 9.34 |
| 6FM230-X | | | 405 | 324 | 275 | 242 | 217 | 200 | 186 | 174 | 163 | 155 | 111 | 89.9 | 77.1 | 68.5 | 54.0 | 45.4 | 38.0 | 32.8 | 28.9 | 26.0 | 23.9 | 20.3 | 10.5 |
| 3FM225-X | | | 390 | 314 | 269 | 238 | 215 | 198 | 184 | 172 | 161 | 153 | 108 | 84.8 | 71.1 | 62.0 | 49.5 | 42.0 | 35.9 | 31.5 | 28.3 | 25.7 | 23.7 | 20.2 | 10.3 |

(Note)The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Current Discharge (Amperes) at 25°C to 1.65 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 64.9 | 44.2 | 34.0 | 26.8 | 22.5 | 19.6 | 17.4 | 15.7 | 14.4 | 13.4 | 12.5 | 11.8 | 8.20 | 6.40 | 5.32 | 4.60 | 3.68 | 3.13 | 2.67 | 2.34 | 2.10 | 1.90 | 1.75 | 1.49 | 0.78 |
| 6FM24-X | 79.5 | 56.3 | 43.3 | 34.9 | 30.1 | 26.3 | 23.3 | 20.9 | 19.2 | 17.6 | 16.5 | 15.1 | 11.1 | 9.03 | 7.49 | 6.54 | 5.24 | 4.34 | 3.80 | 3.38 | 3.03 | 2.75 | 2.52 | 2.13 | 1.19 |
| 6FM33-X | 106 | 77.3 | 59.4 | 47.9 | 40.9 | 36.3 | 32.3 | 29.2 | 26.9 | 24.9 | 23.3 | 21.9 | 15.4 | 12.2 | 10.3 | 8.97 | 7.27 | 6.25 | 5.28 | 4.59 | 4.08 | 3.67 | 3.35 | 2.85 | 1.53 |
| 6FM40-X | 124 | 88.4 | 68.9 | 54.8 | 46.3 | 40.7 | 36.4 | 33.1 | 30.6 | 28.6 | 27.0 | 25.6 | 18.0 | 14.2 | 11.9 | 10.4 | 8.43 | 7.24 | 6.23 | 5.51 | 4.98 | 4.56 | 4.22 | 3.55 | 1.86 |
| 6FM45-X | 136 | 95.0 | 74.3 | 59.9 | 51.3 | 45.5 | 40.8 | 37.2 | 34.4 | 31.7 | 29.5 | 27.6 | 19.6 | 15.6 | 13.2 | 11.6 | 9.14 | 7.66 | 6.63 | 5.89 | 5.34 | 4.90 | 4.54 | 3.86 | 2.02 |
| 6FM55SG-X | 165 | 124 | 95.4 | 76.4 | 65.0 | 57.4 | 50.8 | 45.8 | 41.9 | 38.8 | 36.3 | 34.2 | 24.2 | 19.2 | 16.2 | 14.2 | 11.3 | 9.57 | 8.25 | 7.31 | 6.61 | 6.06 | 5.62 | 4.75 | 2.43 |
| 6FM60-X | 188 | 143 | 110 | 87.5 | 74.0 | 65.0 | 58.1 | 52.9 | 48.9 | 45.1 | 42.0 | 39.4 | 27.9 | 22.1 | 18.6 | 16.3 | 13.1 | 11.1 | 9.55 | 8.44 | 7.61 | 6.97 | 6.45 | 5.48 | 3.06 |
| 6FM65-X | 140 | 95.0 | 74.4 | 62.3 | 52.8 | 45.9 | 41.6 | 38.0 | 34.1 | 31.8 | 29.3 | 27.4 | 20.6 | 16.3 | 13.7 | 11.9 | 9.63 | 8.03 | 6.80 | 6.31 | 5.63 | 5.04 | 4.62 | 3.98 | 2.09 |
| 6FM75-X | 222 | 169 | 131 | 104 | 88.8 | 78.3 | 68.9 | 61.9 | 56.4 | 52.8 | 49.9 | 47.5 | 34.5 | 27.9 | 24.0 | 21.4 | 16.8 | 14.1 | 12.0 | 10.4 | 9.26 | 8.37 | 7.65 | 6.51 | 3.50 |
| 6FM80-X | 233 | 178 | 137 | 110 | 93.8 | 83.0 | 74.1 | 67.4 | 62.2 | 58.0 | 54.5 | 51.6 | 37.1 | 29.8 | 25.5 | 22.5 | 17.7 | 14.7 | 12.5 | 11.0 | 9.79 | 8.88 | 8.15 | 6.86 | 3.70 |
| 6FM90T-X | | 208 | 162 | 129 | 108 | 95.0 | 84.9 | 77.4 | 71.5 | 65.5 | 60.7 | 56.6 | 41.3 | 33.7 | 29.1 | 26.0 | 20.4 | 17.0 | 14.4 | 12.6 | 11.2 | 10.1 | 9.25 | 7.87 | 4.24 |
| 6FM100-X | | 221 | 178 | 141 | 119 | 104 | 93.2 | 85.0 | 78.7 | 72.2 | 66.9 | 62.5 | 45.1 | 36.4 | 31.2 | 27.7 | 21.8 | 18.3 | 15.7 | 13.9 | 12.5 | 11.5 | 10.6 | 9.01 | 4.68 |
| 6FM120-X | | 245 | 195 | 156 | 132 | 116 | 103 | 93.6 | 86.1 | 80.1 | 75.2 | 71.1 | 51.3 | 41.4 | 35.5 | 31.5 | 24.9 | 21.0 | 18.1 | 16.0 | 14.5 | 13.3 | 12.3 | 10.5 | 5.47 |
| 6FM134-X | | 292 | 237 | 191 | 163 | 145 | 128 | 115 | 105 | 96.7 | 89.9 | 84.3 | 60.9 | 49.1 | 42.1 | 37.4 | 29.7 | 25.0 | 21.2 | 18.5 | 16.4 | 14.8 | 13.6 | 11.6 | 6.23 |
| 6FM150-X | | 327 | 267 | 214 | 183 | 162 | 144 | 131 | 120 | 112 | 105 | 99.0 | 71.6 | 57.9 | 49.7 | 44.2 | 34.2 | 28.2 | 23.9 | 20.9 | 18.6 | 16.8 | 15.4 | 13.1 | 7.05 |
| 6FM175 | | | 309 | 248 | 211 | 187 | 165 | 149 | 137 | 127 | 118 | 112 | 80.7 | 65.3 | 56.1 | 49.9 | 39.2 | 32.7 | 27.8 | 24.2 | 21.6 | 19.5 | 17.9 | 15.3 | 7.96 |
| 6FM200-X | | | 350 | 281 | 240 | 212 | 187 | 168 | 153 | 141 | 132 | 124 | 89.8 | 72.7 | 62.4 | 55.6 | 44.1 | 37.2 | 31.6 | 27.5 | 24.5 | 22.2 | 20.3 | 17.3 | 9.29 |
| 6FM230-X | | | 394 | 317 | 271 | 241 | 215 | 196 | 182 | 170 | 160 | 152 | 110 | 89.1 | 76.6 | 68.2 | 53.8 | 45.1 | 37.9 | 32.7 | 28.8 | 25.7 | 23.8 | 20.0 | 10.4 |
| 3FM225-X | | | 367 | 297 | 255 | 227 | 207 | 191 | 179 | 166 | 156 | 147 | 104 | 82.6 | 69.7 | 61.1 | 48.8 | 41.5 | 35.5 | 31.2 | 27.9 | 25.4 | 23.4 | 19.7 | 10.1 |

(Note)The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Current Discharge (Amperes) at 25°C to 1.70 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 63.0 | 43.1 | 33.5 | 26.3 | 21.9 | 19.0 | 16.9 | 15.3 | 14.0 | 13.0 | 12.3 | 11.6 | 8.02 | 6.22 | 5.15 | 4.43 | 3.58 | 3.07 | 2.61 | 2.28 | 2.03 | 1.83 | 1.73 | 1.47 | 0.77 |
| 6FM24-X | 74.0 | 52.5 | 40.5 | 32.8 | 28.3 | 24.7 | 22.0 | 19.8 | 18.1 | 16.7 | 15.7 | 14.4 | 10.7 | 8.65 | 7.23 | 6.31 | 5.08 | 4.24 | 3.70 | 3.30 | 2.95 | 2.69 | 2.48 | 2.10 | 1.17 |
| 6FM33-X | 99.0 | 73.0 | 54.5 | 43.9 | 37.5 | 33.2 | 29.8 | 27.2 | 25.2 | 23.6 | 22.3 | 21.2 | 14.8 | 11.6 | 9.73 | 8.45 | 7.01 | 6.15 | 5.21 | 4.53 | 4.03 | 3.63 | 3.32 | 2.84 | 1.52 |
| 6FM40-X | 119 | 83.7 | 66.7 | 52.8 | 44.5 | 39.0 | 35.3 | 32.6 | 30.5 | 28.4 | 26.6 | 25.2 | 17.7 | 14.0 | 11.7 | 10.2 | 8.27 | 7.11 | 6.14 | 5.45 | 4.93 | 4.53 | 4.21 | 3.52 | 1.84 |
| 6FM45-X | 134 | 90.0 | 73.0 | 58.4 | 49.7 | 43.9 | 38.7 | 34.9 | 31.9 | 30.0 | 28.5 | 27.2 | 19.3 | 15.3 | 12.9 | 11.3 | 8.94 | 7.52 | 6.53 | 5.82 | 5.29 | 4.87 | 4.53 | 3.85 | 2.02 |
| 6FM55SG-X | 155 | 115 | 90.6 | 73.1 | 62.6 | 55.6 | 49.2 | 44.4 | 40.7 | 37.7 | 35.3 | 33.3 | 23.6 | 18.8 | 15.8 | 13.9 | 11.1 | 9.40 | 8.13 | 7.22 | 6.54 | 6.00 | 5.58 | 4.72 | 2.41 |
| 6FM60-X | 180 | 133 | 105 | 84.0 | 71.4 | 63.0 | 56.4 | 51.5 | 47.6 | 44.2 | 41.5 | 39.2 | 27.7 | 22.0 | 18.5 | 16.3 | 12.9 | 10.9 | 9.33 | 8.20 | 7.36 | 6.70 | 6.18 | 5.36 | 2.93 |
| 6FM65-X | 132 | 90.0 | 70.9 | 59.5 | 50.5 | 44.4 | 40.3 | 37.0 | 33.3 | 31.0 | 28.7 | 26.8 | 20.1 | 15.9 | 13.5 | 11.7 | 9.45 | 7.90 | 6.70 | 6.23 | 5.55 | 4.98 | 4.58 | 3.95 | 2.09 |
| 6FM75-X | 206 | 158 | 122 | 99.4 | 86.0 | 77.0 | 67.6 | 60.5 | 55.0 | 51.8 | 49.1 | 46.9 | 33.9 | 27.5 | 23.6 | 21.0 | 16.6 | 13.9 | 11.8 | 10.3 | 9.18 | 8.30 | 7.60 | 6.46 | 3.48 |
| 6FM80-X | 218 | 168 | 132 | 106 | 90.6 | 80.3 | 72.0 | 65.8 | 61.0 | 56.5 | 52.8 | 49.8 | 36.1 | 29.2 | 25.1 | 22.4 | 17.6 | 14.7 | 12.5 | 10.9 | 9.75 | 8.83 | 8.10 | 6.82 | 3.65 |
| 6FM90T-X | | 186 | 153 | 121 | 103 | 90.0 | 80.5 | 73.4 | 67.9 | 63.1 | 59.2 | 56.0 | 40.5 | 32.8 | 28.1 | 25.0 | 19.8 | 16.7 | 14.2 | 12.4 | 11.1 | 10.0 | 9.18 | 7.81 | 4.20 |
| 6FM100-X | | 200 | 164 | 130 | 110 | 96.0 | 86.1 | 78.8 | 73.0 | 68.4 | 64.6 | 61.5 | 44.4 | 35.8 | 30.6 | 27.2 | 21.5 | 18.0 | 15.5 | 13.7 | 12.4 | 11.3 | 10.5 | 8.93 | 4.59 |
| 6FM120-X | | 223 | 187 | 150 | 127 | 112 | 99.9 | 90.9 | 83.8 | 78.2 | 73.5 | 69.7 | 50.4 | 40.7 | 34.9 | 31.0 | 24.5 | 20.7 | 17.8 | 15.8 | 14.2 | 13.1 | 12.2 | 10.4 | 5.39 |
| 6FM134-X | | 280 | 231 | 187 | 160 | 142 | 125 | 112 | 102 | 94.0 | 87.5 | 82.1 | 59.5 | 48.1 | 41.3 | 36.8 | 29.0 | 24.3 | 20.7 | 18.1 | 16.2 | 14.7 | 13.5 | 11.5 | 6.18 |
| 6FM150-X | | 313 | 259 | 210 | 180 | 160 | 142 | 129 | 118 | 109 | 102 | 96.3 | 70.1 | 56.9 | 49.1 | 43.8 | 33.7 | 27.6 | 23.5 | 20.5 | 18.3 | 16.6 | 15.2 | 12.9 | 6.96 |
| 6FM175 | | 298 | 241 | 206 | 183 | 162 | 146 | 134 | 123 | 115 | 108 | 108 | 78.8 | 64.1 | 55.3 | 49.4 | 38.6 | 32.1 | 27.3 | 23.9 | 21.3 | 19.3 | 17.7 | 15.2 | 7.89 |
| 6FM200-X | | 337 | 271 | 232 | 206 | 182 | 163 | 149 | 137 | 128 | 120 | 120 | 87.5 | 71.3 | 61.5 | 55.0 | 43.5 | 36.6 | 31.1 | 27.2 | 24.3 | 22.0 | 20.2 | 17.2 | 9.25 |
| 6FM230-X | | 383 | 311 | 268 | 240 | 214 | 195 | 180 | 168 | 158 | 150 | 109 | 88.3 | 76.0 | 67.8 | 67.8 | 53.5 | 44.9 | 37.7 | 32.5 | 28.6 | 25.6 | 23.6 | 19.9 | 10.3 |
| 3FM225-X | | 358 | 294 | 255 | 230 | 207 | 190 | 176 | 161 | 149 | 139 | 99.8 | 80.4 | 68.7 | 61.0 | 48.4 | 40.8 | 34.9 | 30.7 | 27.5 | 25.1 | 23.1 | 19.4 | 9.90 | |

(Note)The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Current Discharge (Amperes) at 25°C to 1.75 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 60.1 | 41.9 | 32.0 | 25.4 | 21.4 | 18.7 | 16.6 | 15.0 | 13.8 | 12.6 | 11.6 | 10.8 | 7.59 | 5.97 | 5.01 | 4.36 | 3.52 | 3.01 | 2.56 | 2.23 | 1.99 | 1.80 | 1.72 | 1.46 | 0.77 |
| 6FM24-X | 68.5 | 48.8 | 37.8 | 30.6 | 26.4 | 23.1 | 20.8 | 18.6 | 17.1 | 15.7 | 14.8 | 13.7 | 10.2 | 8.28 | 6.96 | 6.09 | 4.91 | 4.13 | 3.60 | 3.23 | 2.88 | 2.64 | 2.44 | 2.07 | 1.16 |
| 6FM33-X | 87.8 | 69.0 | 52.0 | 42.4 | 36.6 | 32.8 | 29.2 | 26.6 | 24.5 | 22.8 | 21.4 | 20.3 | 14.3 | 11.3 | 9.46 | 8.25 | 6.58 | 5.58 | 4.79 | 4.22 | 3.80 | 3.46 | 3.31 | 2.82 | 1.52 |
| 6FM40-X | 110 | 79.1 | 64.9 | 51.5 | 43.4 | 38.0 | 34.3 | 31.5 | 29.3 | 27.5 | 26.1 | 24.9 | 17.4 | 13.7 | 11.4 | 9.95 | 8.11 | 7.00 | 6.02 | 5.33 | 4.81 | 4.40 | 4.07 | 3.48 | 1.82 |
| 6FM45-X | 118 | 85.0 | 69.0 | 54.5 | 45.7 | 39.9 | 36.2 | 33.4 | 31.2 | 29.5 | 28.1 | 26.9 | 19.0 | 15.1 | 12.7 | 11.1 | 8.78 | 7.38 | 6.34 | 5.59 | 5.04 | 4.60 | 4.51 | 3.83 | 2.01 |
| 6FM55SG-X | 145 | 106 | 85.8 | 69.8 | 60.2 | 53.8 | 47.7 | 43.2 | 39.6 | 36.8 | 34.4 | 32.5 | 23.1 | 18.3 | 15.5 | 13.6 | 10.9 | 9.23 | 8.00 | 7.12 | 6.46 | 5.95 | 5.54 | 4.69 | 2.40 |
| 6FM60-X | 167 | 123 | 99.4 | 80.2 | 68.6 | 60.9 | 54.6 | 49.9 | 46.2 | 43.3 | 40.9 | 38.9 | 27.4 | 21.7 | 18.3 | 16.0 | 12.7 | 10.7 | 9.18 | 8.10 | 7.29 | 6.66 | 6.15 | 5.23 | 2.81 |
| 6FM65-X | 123 | 85.0 | 67.5 | 56.8 | 48.3 | 42.8 | 38.9 | 36.0 | 32.4 | 30.3 | 28.0 | 26.1 | 19.7 | 15.6 | 13.2 | 11.4 | 9.28 | 7.78 | 6.60 | 6.14 | 5.48 | 4.91 | 4.54 | 3.93 | 2.08 |
| 6FM75-X | 195 | 151 | 117 | 96.1 | 83.4 | 73.6 | 65.9 | 59.0 | 53.7 | 50.3 | 47.6 | 45.3 | 33.0 | 26.8 | 23.1 | 20.6 | 16.2 | 13.5 | 11.5 | 10.1 | 9.04 | 8.21 | 7.55 | 6.42 | 3.46 |
| 6FM80-X | 204 | 159 | 126 | 102 | 87.3 | 77.6 | 68.9 | 62.4 | 57.3 | 53.2 | 49.9 | 47.1 | 34.4 | 28.1 | 24.3 | 21.8 | 17.2 | 14.4 | 12.3 | 10.8 | 9.63 | 8.75 | 8.05 | 6.78 | 3.63 |
| 6FM90T-X | | 175 | 142 | 114 | 98.2 | 87.3 | 78.0 | 71.0 | 65.5 | 61.1 | 57.6 | 54.6 | 39.4 | 31.8 | 27.2 | 24.2 | 19.2 | 16.2 | 13.8 | 12.1 | 10.9 | 9.89 | 9.10 | 7.74 | 4.17 |
| 6FM100-X | | 187 | 153 | 123 | 105 | 93.0 | 83.7 | 76.7 | 71.3 | 67.0 | 63.4 | 60.5 | 43.7 | 35.3 | 30.2 | 26.9 | 21.0 | 17.5 | 15.1 | 13.4 | 12.1 | 11.1 | 10.3 | 8.76 | 4.50 |
| 6FM120-X | | 210 | 179 | 144 | 122 | 108 | 96.4 | 87.8 | 81.0 | 75.6 | 71.2 | 67.5 | 49.0 | 39.8 | 34.2 | 30.5 | 24.0 | 20.0 | 17.3 | 15.4 | 14.0 | 12.9 | 12.1 | 10.3 | 5.31 |
| 6FM134-X | | 257 | 214 | 177 | 154 | 139 | 122 | 110 | 99.8 | 92.0 | 85.5 | 80.2 | 58.2 | 47.1 | 40.5 | 36.1 | 28.3 | 23.6 | 20.2 | 17.8 | 16.0 | 14.6 | 13.5 | 11.4 | 6.17 |
| 6FM150-X | | 288 | 240 | 198 | 173 | 156 | 138 | 125 | 114 | 106 | 99.0 | 93.4 | 68.4 | 55.9 | 48.4 | 43.4 | 33.2 | 27.0 | 23.0 | 20.2 | 18.1 | 16.4 | 15.1 | 12.8 | 6.91 |
| 6FM175 | | 280 | 229 | 198 | 178 | 157 | 142 | 130 | 120 | 112 | 105 | 105 | 76.8 | 62.6 | 54.1 | 48.4 | 37.8 | 31.5 | 26.9 | 23.6 | 21.1 | 19.1 | 17.6 | 15.1 | 7.85 |
| 6FM200-X | | 319 | 260 | 224 | 200 | 177 | 159 | 145 | 134 | 125 | 117 | 117 | 85.2 | 69.3 | 59.8 | 53.4 | 42.5 | 36.0 | 30.7 | 26.9 | 24.1 | 21.9 | 20.1 | 17.1 | 9.20 |
| 6FM230-X | | 372 | 304 | 263 | 236 | 211 | 193 | 178 | 166 | 157 | 149 | 149 | 108 | 87.3 | 75.0 | 66.8 | 53.0 | 44.6 | 37.5 | 32.3 | 28.5 | 25.5 | 23.1 | 19.8 | 10.3 |
| 3FM225-X | | 345 | 282 | 244 | 219 | 196 | 178 | 165 | 155 | 148 | 141 | 101 | 80.3 | 68.2 | 60.1 | 47.5 | 40.0 | 34.3 | 30.2 | 27.1 | 24.7 | 22.8 | 20.1 | 17.1 | 9.80 |

(Note)The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Current Discharge (Amperes) at 25°C to 1.80 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 57.4 | 40.8 | 31.0 | 24.5 | 20.6 | 18.0 | 16.1 | 14.6 | 13.5 | 12.3 | 11.3 | 10.5 | 7.39 | 5.84 | 4.90 | 4.28 | 3.44 | 2.93 | 2.49 | 2.18 | 1.95 | 1.77 | 1.70 | 1.45 | 0.76 |
| 6FM24-X | 63.0 | 45.0 | 35.0 | 28.5 | 24.5 | 21.5 | 19.5 | 17.5 | 16.0 | 14.8 | 14.0 | 13.0 | 9.80 | 7.90 | 6.70 | 5.86 | 4.75 | 4.02 | 3.50 | 3.15 | 2.80 | 2.58 | 2.40 | 2.04 | 1.14 |
| 6FM33-X | 79.5 | 60.0 | 49.5 | 40.7 | 35.4 | 31.9 | 28.4 | 25.8 | 23.8 | 22.2 | 20.9 | 19.8 | 14.0 | 11.1 | 9.35 | 8.18 | 6.51 | 5.50 | 4.70 | 4.13 | 3.70 | 3.37 | 3.30 | 2.81 | 1.51 |
| 6FM40-X | 101 | 71.9 | 58.7 | 47.5 | 40.8 | 36.3 | 33.1 | 30.8 | 28.9 | 26.9 | 25.2 | 23.8 | 16.8 | 13.2 | 11.1 | 9.72 | 7.90 | 6.80 | 5.87 | 5.20 | 4.70 | 4.31 | 4.00 | 3.40 | 1.79 |
| 6FM45-X | 114 | 80.0 | 66.0 | 52.5 | 44.4 | 39.0 | 35.4 | 32.6 | 30.5 | 28.9 | 27.6 | 26.5 | 18.7 | 14.8 | 12.5 | 10.9 | 8.66 | 7.30 | 6.27 | 5.54 | 4.99 | 4.56 | 4.50 | 3.83 | 2.01 |
| 6FM55SG-X | 134 | 99.8 | 79.5 | 65.7 | 57.4 | 51.9 | 46.1 | 41.8 | 38.4 | 35.7 | 33.5 | 31.7 | 22.5 | 17.9 | 15.1 | 13.3 | 10.7 | 9.06 | 7.87 | 7.03 | 6.39 | 5.90 | 5.50 | 4.65 | 2.38 |
| 6FM60-X | 155 | 112 | 92.0 | 75.4 | 65.4 | 58.7 | 52.8 | 48.4 | 44.9 | 41.6 | 38.8 | 36.6 | 25.9 | 20.5 | 17.3 | 15.2 | 12.3 | 10.5 | 9.00 | 7.93 | 7.13 | 6.50 | 6.00 | 5.10 | 2.68 |
| 6FM65-X | 114 | 80.0 | 64.0 | 54.0 | 46.0 | 41.2 | 37.5 | 35.0 | 31.5 | 29.5 | 27.3 | 25.5 | 19.2 | 15.2 | 12.9 | 11.2 | 9.10 | 7.65 | 6.50 | 6.05 | 5.40 | 4.85 | 4.50 | 3.90 | 2.07 |
| 6FM75-X | 180 | 139 | 112 | 92.6 | 80.9 | 73.1 | 64.6 | 58.3 | 53.3 | 49.3 | 46.1 | 43.4 | 31.6 | 25.7 | 22.2 | 19.8 | 15.7 | 13.3 | 11.4 | 9.99 | 8.95 | 8.14 | 7.50 | 6.38 | 3.43 |
| 6FM80-X | 190 | 149 | 118 | 96.5 | 83.6 | 75.0 | 66.8 | 60.7 | 55.9 | 52.1 | 48.9 | 46.3 | 33.5 | 27.1 | 23.2 | 20.7 | 16.6 | 14.1 | 12.1 | 10.6 | 9.52 | 8.68 | 8.00 | 6.73 | 3.61 |
| 6FM90T-X | | 163 | 132 | 108 | 93.8 | 84.2 | 75.1 | 68.3 | 63.0 | 58.8 | 55.3 | 52.4 | 37.8 | 30.4 | 26.0 | 23.1 | 18.5 | 15.7 | 13.5 | 11.9 | 10.7 | 9.74 | 9.00 | 7.65 | 4.12 |
| 6FM100-X | | 175 | 143 | 117 | 101 | 91.0 | 82.0 | 75.3 | 70.0 | 65.0 | 60.8 | 57.4 | 41.4 | 33.3 | 28.5 | 25.3 | 20.2 | 17.2 | 14.8 | 13.1 | 11.8 | 10.8 | 10.0 | 8.50 | 4.42 |
| 6FM120-X | | 197 | 167 | 137 | 118 | 106 | 94.4 | 85.7 | 78.9 | 73.5 | 69.1 | 65.4 | 46.8 | 37.4 | 31.8 | 28.1 | 22.6 | 19.3 | 16.8 | 15.0 | 13.6 | 12.6 | 12.0 | 10.2 | 5.24 |
| 6FM134-X | | 235 | 197 | 166 | 147 | 134 | 118 | 106 | 96.7 | 89.2 | 83.1 | 78.0 | 56.6 | 45.9 | 39.5 | 35.2 | 27.6 | 23.0 | 19.8 | 17.5 | 15.8 | 14.5 | 13.4 | 11.3 | 6.14 |
| 6FM150-X | | 264 | 222 | 186 | 164 | 150 | 133 | 120 | 110 | 102 | 95.8 | 90.5 | 66.0 | 53.7 | 46.3 | 41.4 | 32.1 | 26.5 | 22.7 | 19.9 | 17.9 | 16.3 | 15.0 | 12.7 | 6.87 |
| 6FM175 | | | 246 | 207 | 184 | 169 | 150 | 136 | 125 | 116 | 108 | 102 | 74.2 | 60.2 | 51.8 | 46.2 | 36.7 | 31.0 | 26.5 | 23.3 | 20.9 | 19.0 | 17.5 | 15.0 | 7.80 |
| 6FM200-X | | | 269 | 228 | 203 | 187 | 167 | 152 | 140 | 130 | 121 | 114 | 82.5 | 66.8 | 57.3 | 51.0 | 41.3 | 35.4 | 30.3 | 26.6 | 23.9 | 21.7 | 20.0 | 17.0 | 9.16 |
| 6FM230-X | | | 360 | 297 | 259 | 233 | 209 | 190 | 176 | 164 | 155 | 147 | 107 | 86.6 | 74.5 | 66.5 | 52.6 | 44.3 | 37.2 | 32.1 | 28.3 | 25.4 | 23.0 | 19.7 | 10.2 |
| 3FM225-X | | | 299 | 249 | 219 | 199 | 181 | 168 | 157 | 145 | 135 | 126 | 90.6 | 72.6 | 61.9 | 54.7 | 45.0 | 39.1 | 33.6 | 29.6 | 26.7 | 24.3 | 22.5 | 18.8 | 9.60 |

(Note) The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Power Discharge (Watts per cell) at 25°C to 1.60 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 133 | 83.6 | 65.0 | 51.7 | 43.6 | 38.3 | 34.5 | 31.6 | 29.4 | 27.0 | 25.0 | 23.4 | 16.3 | 12.7 | 10.5 | 9.10 | 7.33 | 6.27 | 5.28 | 4.57 | 4.04 | 3.62 | 3.29 | 2.81 | 1.55 |
| 6FM24-X | 150 | 107 | 82.2 | 66.2 | 57.3 | 50.0 | 44.0 | 39.6 | 36.5 | 33.5 | 31.5 | 29.0 | 21.5 | 17.7 | 14.8 | 13.0 | 10.5 | 8.83 | 7.75 | 6.86 | 6.17 | 5.58 | 5.11 | 4.32 | 2.42 |
| 6FM33-X | 215 | 150 | 117 | 94.8 | 81.4 | 72.4 | 64.5 | 58.5 | 53.8 | 48.6 | 44.4 | 40.9 | 29.2 | 23.3 | 19.8 | 17.4 | 14.2 | 12.2 | 10.3 | 9.02 | 8.02 | 7.25 | 6.63 | 5.64 | 3.04 |
| 6FM40-X | 251 | 177 | 141 | 117 | 103 | 92.9 | 83.1 | 75.7 | 70.0 | 64.2 | 59.5 | 55.6 | 39.3 | 31.2 | 26.3 | 23.0 | 18.0 | 15.0 | 12.9 | 11.5 | 10.2 | 9.29 | 8.71 | 7.38 | 3.97 |
| 6FM45-X | 263 | 187 | 147 | 123 | 108 | 98.6 | 88.3 | 80.6 | 74.6 | 68.4 | 63.4 | 59.2 | 41.9 | 33.2 | 28.0 | 24.5 | 19.1 | 15.8 | 13.5 | 11.9 | 10.7 | 9.77 | 9.02 | 7.69 | 4.14 |
| 6FM55SG-X | 318 | 229 | 182 | 146 | 125 | 111 | 100 | 91.7 | 85.3 | 78.7 | 73.4 | 68.9 | 49.0 | 39.1 | 33.1 | 29.1 | 22.7 | 18.8 | 16.2 | 14.3 | 12.9 | 11.8 | 10.9 | 9.25 | 5.06 |
| 6FM60-X | 350 | 259 | 200 | 161 | 138 | 122 | 110 | 101 | 94.1 | 87.5 | 82.1 | 77.6 | 55.6 | 44.5 | 37.4 | 33.0 | 26.3 | 22.2 | 19.1 | 16.6 | 14.8 | 13.3 | 12.2 | 10.3 | 5.52 |
| 6FM65-X | 263 | 178 | 141 | 118 | 100 | 87.8 | 79.8 | 72.8 | 65.5 | 61.0 | 57.0 | 53.7 | 40.3 | 31.9 | 26.9 | 23.3 | 18.9 | 15.9 | 13.5 | 12.5 | 11.2 | 10.0 | 9.15 | 7.88 | 4.20 |
| 6FM75-X | 413 | 314 | 246 | 202 | 175 | 158 | 142 | 129 | 120 | 110 | 102 | 95.7 | 67.9 | 54.1 | 45.7 | 40.2 | 31.8 | 26.8 | 22.9 | 20.1 | 18.0 | 16.4 | 15.1 | 12.8 | 6.90 |
| 6FM80-X | 433 | 323 | 258 | 212 | 184 | 165 | 147 | 134 | 124 | 114 | 105 | 98.6 | 70.5 | 56.5 | 48.1 | 42.5 | 33.4 | 27.9 | 24.0 | 21.2 | 19.1 | 17.4 | 16.1 | 13.7 | 7.30 |
| 6FM90T-X | | 373 | 308 | 249 | 213 | 189 | 170 | 156 | 145 | 134 | 125 | 117 | 82.8 | 65.5 | 55.2 | 48.3 | 38.3 | 32.3 | 27.6 | 24.2 | 21.7 | 19.7 | 18.1 | 15.4 | 8.28 |
| 6FM100-X | | 392 | 321 | 260 | 223 | 199 | 178 | 162 | 150 | 140 | 131 | 124 | 88.4 | 70.6 | 60.0 | 52.8 | 42.2 | 35.8 | 30.6 | 26.9 | 24.2 | 22 | 20.3 | 17.4 | 9.25 |
| 6FM120-X | | 449 | 370 | 299 | 256 | 227 | 204 | 186 | 172 | 160 | 149 | 141 | 100 | 79.6 | 67.3 | 59.2 | 46.9 | 39.5 | 34.1 | 30.3 | 27.4 | 25.1 | 23.3 | 21.0 | 11.0 |
| 6FM134-X | | 566 | 474 | 381 | 324 | 287 | 252 | 226 | 206 | 189 | 175 | 163 | 117 | 94.6 | 80.9 | 71.8 | 56.6 | 47.4 | 40.6 | 35.7 | 32.0 | 29.2 | 26.9 | 22.9 | 12.3 |
| 6FM150-X | | 637 | 542 | 438 | 375 | 333 | 295 | 266 | 243 | 223 | 206 | 192 | 138 | 111 | 95.3 | 84.5 | 66.3 | 55.4 | 47.1 | 41.2 | 36.8 | 33.3 | 30.5 | 25.6 | 13.8 |
| 6FM175 | | | 584 | 476 | 411 | 368 | 325 | 293 | 269 | 246 | 227 | 211 | 154 | 125 | 108 | 96.8 | 76.4 | 64.2 | 54.6 | 47.7 | 42.6 | 38.6 | 35.4 | 30.3 | 15.8 |
| 6FM200-X | | | 625 | 514 | 447 | 402 | 356 | 321 | 294 | 268 | 247 | 230 | 170 | 139 | 121 | 109 | 86.5 | 73.0 | 62.1 | 54.3 | 48.4 | 43.8 | 40.2 | 34.2 | 18.4 |
| 6FM230-X | | | 680 | 585 | 514 | 469 | 423 | 388 | 361 | 335 | 314 | 296 | 213 | 172 | 147 | 131 | 104 | 86.7 | 73.0 | 63.2 | 55.9 | 50.2 | 45.6 | 39.2 | 20.8 |
| 3FM225-X | | | 677 | 581 | 511 | 465 | 414 | 377 | 348 | 320 | 298 | 279 | 201 | 162 | 138 | 123 | 97.1 | 81.7 | 69.5 | 60.8 | 54.3 | 49.3 | 45.2 | 38.5 | 20.7 |

(Note) The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Power Discharge (Watts per cell) at 25°C to 1.65 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 127 | 82.2 | 64.6 | 51.2 | 43.2 | 37.8 | 34.1 | 31.3 | 29.1 | 26.7 | 24.8 | 23.2 | 16.1 | 12.6 | 10.4 | 9.01 | 7.25 | 6.20 | 5.23 | 4.53 | 4.01 | 3.60 | 3.28 | 2.80 | 1.52 |
| 6FM24-X | 141 | 101 | 77.7 | 62.7 | 54.2 | 47.4 | 42.0 | 37.8 | 34.8 | 32.0 | 30.2 | 27.9 | 20.8 | 17.1 | 14.3 | 12.6 | 10.2 | 8.62 | 7.56 | 6.72 | 6.03 | 5.48 | 5.04 | 4.27 | 2.39 |
| 6FM33-X | 207 | 145 | 110 | 89.7 | 77.5 | 69.3 | 62.4 | 57.2 | 53.2 | 48.1 | 44.0 | 40.5 | 28.9 | 23.1 | 19.6 | 17.3 | 13.9 | 11.9 | 10.1 | 8.80 | 7.83 | 7.07 | 6.47 | 5.51 | 2.96 |
| 6FM40-X | 233 | 163 | 128 | 105 | 91.9 | 82.9 | 74.7 | 68.6 | 63.8 | 58.8 | 54.6 | 51.2 | 36.5 | 29.1 | 24.7 | 21.7 | 17.0 | 14.1 | 12.2 | 10.9 | 9.90 | 9.12 | 8.50 | 7.25 | 3.90 |
| 6FM45-X | 246 | 174 | 140 | 113 | 97.5 | 86.9 | 78.6 | 72.4 | 67.6 | 62.5 | 58.3 | 54.8 | 38.8 | 30.8 | 26.0 | 22.8 | 17.8 | 14.8 | 12.8 | 11.4 | 10.3 | 9.48 | 8.81 | 7.49 | 4.04 |
| 6FM55SG-X | 300 | 225 | 177 | 143 | 123 | 109 | 98.3 | 90.3 | 84.0 | 77.3 | 71.9 | 67.3 | 47.9 | 38.2 | 32.4 | 28.5 | 22.3 | 18.6 | 16.0 | 14.1 | 12.8 | 11.7 | 10.8 | 9.19 | 4.95 |
| 6FM60-X | 337 | 248 | 190 | 153 | 131 | 116 | 106 | 98.5 | 92.6 | 85.9 | 80.4 | 75.8 | 54.3 | 43.6 | 37.1 | 32.8 | 26.1 | 22.1 | 18.8 | 16.4 | 14.6 | 13.2 | 12.1 | 10.2 | 5.49 |
| 6FM65-X | 250 | 171 | 136 | 114 | 97.0 | 85.6 | 77.9 | 71.4 | 64.3 | 60.0 | 56.0 | 52.7 | 39.6 | 31.3 | 26.5 | 22.9 | 18.6 | 15.7 | 13.3 | 12.4 | 11.1 | 9.93 | 9.13 | 7.87 | 4.20 |
| 6FM75-X | 403 | 300 | 241 | 197 | 170 | 153 | 138 | 127 | 118 | 108 | 100 | 93.6 | 66.4 | 52.8 | 44.6 | 39.2 | 31.3 | 26.6 | 22.6 | 19.8 | 17.7 | 16.0 | 14.7 | 12.5 | 6.74 |
| 6FM80-X | 420 | 310 | 250 | 204 | 176 | 157 | 142 | 131 | 122 | 112 | 104 | 97.8 | 69.5 | 55.3 | 46.8 | 41.1 | 32.5 | 27.4 | 23.5 | 20.7 | 18.6 | 17.0 | 15.7 | 13.3 | 7.20 |
| 6FM90T-X | | 364 | 303 | 241 | 205 | 180 | 162 | 149 | 139 | 128 | 119 | 112 | 80.1 | 64.1 | 54.6 | 48.2 | 38.0 | 31.9 | 27.2 | 23.8 | 21.3 | 19.3 | 17.7 | 15.1 | 8.13 |
| 6FM100-X | | 379 | 315 | 252 | 213 | 188 | 170 | 156 | 146 | 135 | 125 | 118 | 84.5 | 67.8 | 57.8 | 51.2 | 41.3 | 35.4 | 30.3 | 26.7 | 23.9 | 21.8 | 20.1 | 17.1 | 9.20 |
| 6FM120-X | | 426 | 358 | 289 | 248 | 220 | 199 | 183 | 171 | 158 | 147 | 137 | 97.0 | 76.8 | 64.7 | 56.6 | 45.5 | 38.9 | 33.7 | 29.9 | 27.1 | 24.9 | 23.2 | 20.1 | 10.8 |
| 6FM134-X | | 529 | 433 | 347 | 295 | 261 | 235 | 215 | 200 | 183 | 169 | 158 | 114 | 92.2 | 79.1 | 70.3 | 55.7 | 47.0 | 40.1 | 35.2 | 31.5 | 28.6 | 26.3 | 22.4 | 12.1 |
| 6FM150-X | | 614 | 504 | 404 | 344 | 304 | 274 | 252 | 235 | 215 | 199 | 186 | 135 | 109 | 94.1 | 83.9 | 65.3 | 54.1 | 45.9 | 40.0 | 35.6 | 32.1 | 29.4 | 25.0 | 13.5 |
| 6FM175 | | | 554 | 451 | 388 | 347 | 310 | 282 | 261 | 239 | 221 | 206 | 151 | 123 | 106 | 95.5 | 75.2 | 63.1 | 53.5 | 46.6 | 41.5 | 37.5 | 34.3 | 29.4 | 15.3 |
| 6FM200-X | | | 604 | 497 | 433 | 390 | 345 | 312 | 286 | 262 | 242 | 225 | 166 | 137 | 119 | 107 | 85.1 | 72.0 | 61.1 | 53.3 | 47.4 | 42.8 | 39.2 | 33.3 | 17.9 |
| 6FM230-X | | | 673 | 570 | 507 | 466 | 420 | 386 | 359 | 333 | 312 | 294 | 212 | 171 | 147 | 130 | 103 | 86.4 | 72.8 | 63.0 | 55.7 | 50.0 | 45.4 | 39.0 | 20.5 |
| 3FM225-X | | | 650 | 539 | 472 | 428 | 382 | 348 | 321 | 299 | 280 | 265 | 192 | 156 | 134 | 119 | 95.4 | 81.1 | 68.9 | 60.2 | 53.7 | 48.6 | 44.5 | 37.8 | 20.4 |

(Note) The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

| Constant Power Discharge (Watts per cell) at 25°C to 1.70 volts per cell | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
| 6FM17-X | 118 | 80.8 | 63.0 | 50.1 | 42.4 | 37.2 | 33.6 | 30.8 | 28.7 | 26.4 | 24.6 | 23.0 | 16.0 | 12.4 | 10.3 | 8.90 | 7.16 | 6.12 | 5.16 | 4.48 | 3.97 | 3.57 | 3.25 | 2.78 | 1.51 |
| 6FM24-X | 131 | 94.3 | 73.1 | 59.2 | 51.2 | 44.8 | 39.9 | 35.9 | 33.0 | 30.5 | 28.9 | 26.8 | 20.1 | 16.4 | 13.9 | 12.2 | 9.95 | 8.42 | 7.37 | 6.58 | 5.89 | 5.38 | 4.97 | 4.21 | 2.37 |
| 6FM33-X | 185 | 136 | 107 | 85.8 | 73.0 | 64.5 | 58.8 | 54.5 | 51.2 | 46.7 | 43.0 | 39.9 | 28.4 | 22.6 | 19.1 | 16.8 | 13.5 | 11.5 | 9.74 | 8.52 | 7.60 | 6.88 | 6.31 | 5.36 | 2.89 |
| 6FM40-X | 215 | 155 | 124 | 102 | 89.0 | 80.3 | 71.8 | 65.5 | 60.5 | 56.4 | 53.1 | 50.3 | 35.6 | 28.3 | 23.8 | 20.9 | 16.5 | 13.9 | 12.1 | 10.8 | 9.79 | 9.03 | 8.42 | 7.16 | 3.85 |
| 6FM45-X | 232 | 166 | 135 | 109 | 94.0 | 83.8 | 75.9 | 69.9 | 65.3 | 60.8 | 57.1 | 54.0 | 38.3 | 30.4 | 25.7 | 22.5 | 17.6 | 14.7 | 12.7 | 11.2 | 10.1 | 9.30 | 8.63 | 7.34 | 3.95 |
| 6FM55SG-X | 281 | 213 | 169 | 138 | 119 | 107 | 96.4 | 88.5 | 82.3 | 75.7 | 70.3 | 65.8 | 46.9 | 37.4 | 31.7 | 27.9 | 21.8 | 18.2 | 15.7 | 13.9 | 12.5 | 11.4 | 10.6 | 9.02 | 4.85 |
| 6FM60-X | 317 | 234 | 187 | 151 | 129 | 114 | 104 | 96.5 | 90.7 | 84.1 | 78.6 | 74.1 | 53.1 | 42.6 | 36.3 | 32.1 | 25.6 | 21.7 | 18.5 | 16.2 | 14.4 | 13.1 | 12.0 | 10.2 | 5.48 |
| 6FM65-X | 237 | 164 | 131 | 111 | 93.9 | 83.3 | 75.9 | 70.1 | 63.2 | 59.0 | 54.9 | 51.6 | 38.8 | 30.8 | 26.0 | 22.6 | 18.4 | 15.5 | 13.2 | 12.3 | 11.0 | 9.85 | 9.10 | 7.87 | 4.20 |
| 6FM75-X | 375 | 290 | 237 | 191 | 163 | 145 | 131 | 120 | 111 | 103 | 95.7 | 89.8 | 64.4 | 51.6 | 44.0 | 38.9 | 30.8 | 26.0 | 22.1 | 19.4 | 17.3 | 15.7 | 14.4 | 12.3 | 6.61 |
| 6FM80-X | 390 | 299 | 246 | 199 | 170 | 151 | 136 | 126 | 117 | 108 | 100 | 93.8 | 67.1 | 53.7 | 45.7 | 40.4 | 32.0 | 27.0 | 23.1 | 20.4 | 18.3 | 16.7 | 15.4 | 13.1 | 7.10 |
| 6FM90T-X | | 345 | 284 | 227 | 194 | 171 | 153 | 140 | 129 | 120 | 113 | 107 | 76.9 | 61.8 | 52.8 | 46.8 | 37.2 | 31.5 | 26.8 | 23.4 | 20.9 | 19.0 | 17.4 | 14.8 | 7.99 |
| 6FM100-X | | 360 | 299 | 241 | 206 | 183 | 163 | 149 | 137 | 128 | 121 | 114 | 82.6 | 66.8 | 57.3 | 50.9 | 41.0 | 35.0 | 30.0 | 26.4 | 23.8 | 21.7 | 20.0 | 17.0 | 9.13 |
| 6FM120-X | | 404 | 346 | 280 | 240 | 213 | 189 | 171 | 157 | 147 | 138 | 131 | 93.0 | 74.0 | 62.6 | 55.0 | 44.6 | 38.3 | 33.2 | 29.6 | 26.8 | 24.7 | 23.0 | 19.7 | 10.6 |
| 6FM134-X | | 512 | 427 | 343 | 292 | 258 | 231 | 211 | 195 | 179 | 165 | 154 | 112 | 90.6 | 78.0 | 69.5 | 54.8 | 45.9 | 39.2 | 34.4 | 30.8 | 27.9 | 25.7 | 21.8 | 11.7 |
| 6FM150-X | | 566 | 469 | 385 | 334 | 300 | 270 | 247 | 229 | 210 | 194 | 181 | 132 | 108 | 93.1 | 83.3 | 64.5 | 53.2 | 45.1 | 39.3 | 35.0 | 31.6 | 28.9 | 24.6 | 13.2 |
| 6FM175 | | | 528 | 434 | 378 | 341 | 304 | 276 | 254 | 233 | 215 | 201 | 148 | 121 | 105 | 94.2 | 74.2 | 62.2 | 52.7 | 45.9 | 40.8 | 36.8 | 33.7 | 28.9 | 15.0 |
| 6FM200-X | | | 586 | 484 | 423 | 382 | 338 | 305 | 279 | 256 | 237 | 221 | 163 | 134 | 117 | 105 | 83.9 | 71.2 | 60.3 | 52.5 | 46.6 | 42.0 | 38.4 | 32.6 | 17.6 |
| 6FM230-X | | | 666 | 564 | 503 | 462 | 417 | 383 | 357 | 331 | 309 | 291 | 210 | 169 | 145 | 129 | 102 | 86.1 | 72.5 | 62.8 | 55.5 | 49.8 | 45.2 | 38.8 | 20.2 |
| 3FM225-X | | | 629 | 521 | 456 | 413 | 371 | 340 | 315 | 293 | 275 | 259 | 186 | 150 | 128 | 113 | 92.7 | 80.5 | 68.3 | 59.6 | 53.1 | 48.0 | 43.9 | 37.3 | 20.1 |

(Note) The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

Constant Power Discharge (Watts per cell) at 25°C to 1.75 volts per cell

| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
|--------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 6FM17-X | 115 | 79.3 | 62.0 | 49.4 | 41.8 | 36.7 | 33.1 | 30.5 | 28.4 | 26.1 | 24.3 | 22.7 | 15.8 | 12.3 | 10.2 | 8.83 | 7.09 | 6.05 | 5.11 | 4.43 | 3.93 | 3.53 | 3.22 | 2.76 | 1.50 |
| 6FM24-X | 122 | 87.9 | 68.6 | 55.7 | 48.1 | 42.1 | 37.9 | 34.1 | 31.3 | 29.0 | 27.5 | 25.6 | 19.4 | 15.8 | 13.4 | 11.8 | 9.68 | 8.21 | 7.17 | 6.43 | 5.74 | 5.28 | 4.89 | 4.16 | 2.34 |
| 6FM33-X | 170 | 132 | 103 | 82.6 | 70.7 | 62.7 | 56.9 | 52.5 | 49.1 | 45.1 | 41.8 | 39.1 | 27.6 | 21.8 | 18.3 | 16.0 | 13.1 | 11.3 | 9.60 | 8.38 | 7.47 | 6.77 | 6.20 | 5.27 | 2.84 |
| 6FM40-X | 198 | 148 | 120 | 98.9 | 86.2 | 77.7 | 69.8 | 63.9 | 59.3 | 55.4 | 52.2 | 49.5 | 35.1 | 27.8 | 23.5 | 20.6 | 16.3 | 13.7 | 11.9 | 10.6 | 9.58 | 8.82 | 8.21 | 6.98 | 3.76 |
| 6FM45-X | 212 | 156 | 127 | 104 | 90.9 | 81.8 | 74.2 | 68.6 | 64.1 | 59.7 | 56.1 | 53.1 | 37.7 | 30.0 | 25.4 | 22.3 | 17.4 | 14.5 | 12.5 | 11.0 | 9.96 | 9.11 | 8.44 | 7.17 | 3.86 |
| 6FM55SG-X | 261 | 200 | 162 | 134 | 116 | 105 | 94.5 | 86.6 | 80.5 | 74.0 | 68.7 | 64.3 | 45.8 | 36.6 | 31.0 | 27.3 | 21.5 | 18.0 | 15.5 | 13.7 | 12.3 | 11.2 | 10.4 | 8.84 | 4.76 |
| 6FM60-X | 296 | 220 | 183 | 148 | 126 | 112 | 102 | 94.5 | 88.7 | 82.2 | 76.8 | 72.4 | 51.9 | 41.7 | 35.5 | 31.4 | 25.1 | 21.4 | 18.2 | 16.0 | 14.3 | 13.0 | 11.9 | 10.1 | 5.46 |
| 6FM65-X | 223 | 156 | 126 | 107 | 90.9 | 81.1 | 74.0 | 68.7 | 62.0 | 58.0 | 53.9 | 50.6 | 38.1 | 30.2 | 25.6 | 22.2 | 18.1 | 15.2 | 13.0 | 12.1 | 10.8 | 9.78 | 9.08 | 7.86 | 4.19 |
| 6FM75-X | 356 | 274 | 223 | 183 | 158 | 142 | 129 | 119 | 111 | 101 | 93.2 | 86.5 | 62.4 | 50.3 | 43.1 | 38.3 | 30.6 | 26.0 | 22.1 | 19.3 | 17.2 | 15.5 | 14.2 | 12.0 | 6.48 |
| 6FM80-X | 368 | 287 | 232 | 191 | 166 | 149 | 134 | 123 | 114 | 105 | 98.2 | 92.3 | 66.1 | 53.0 | 45.1 | 39.9 | 31.7 | 26.8 | 22.9 | 20.1 | 18.0 | 16.4 | 15.1 | 12.8 | 7.00 |
| 6FM90T-X | | 343 | 281 | 224 | 190 | 167 | 150 | 138 | 128 | 118 | 110 | 103 | 74.2 | 59.8 | 51.2 | 45.4 | 36.2 | 30.7 | 26.2 | 22.9 | 20.5 | 18.6 | 17.1 | 14.6 | 7.84 |
| 6FM100-X | | 353 | 294 | 236 | 200 | 177 | 159 | 145 | 134 | 125 | 117 | 111 | 80.0 | 64.5 | 55.3 | 49.1 | 39.9 | 34.4 | 29.4 | 25.9 | 23.3 | 21.2 | 19.6 | 16.7 | 8.98 |
| 6FM120-X | | 383 | 334 | 270 | 232 | 206 | 184 | 167 | 154 | 143 | 135 | 128 | 91.0 | 72.6 | 61.5 | 54.1 | 43.7 | 37.4 | 32.5 | 29.1 | 26.5 | 24.4 | 22.8 | 19.3 | 10.4 |
| 6FM134-X | | 483 | 414 | 334 | 286 | 254 | 227 | 208 | 192 | 176 | 163 | 152 | 110 | 89.5 | 76.9 | 68.6 | 53.7 | 44.8 | 38.3 | 33.6 | 30.1 | 27.4 | 25.2 | 21.4 | 11.5 |
| 6FM150-X | | 532 | 444 | 369 | 324 | 294 | 264 | 242 | 224 | 205 | 190 | 177 | 130 | 106 | 91.6 | 82.1 | 63.4 | 52.1 | 44.2 | 38.6 | 34.4 | 31.1 | 28.5 | 24.2 | 13.0 |
| 6FM175 | | | 511 | 422 | 369 | 333 | 297 | 270 | 249 | 228 | 211 | 197 | 144 | 118 | 102 | 91.6 | 72.6 | 61.2 | 51.8 | 45.1 | 40.1 | 36.2 | 33.1 | 28.4 | 14.7 |
| 6FM200-X | | | 578 | 475 | 413 | 372 | 330 | 299 | 274 | 251 | 233 | 217 | 159 | 130 | 113 | 101 | 81.8 | 70.2 | 59.3 | 51.6 | 45.8 | 41.2 | 37.6 | 31.9 | 17.2 |
| 6FM230-X | | | 658 | 558 | 499 | 459 | 415 | 381 | 355 | 328 | 306 | 288 | 208 | 168 | 144 | 128 | 101 | 85.8 | 72.2 | 62.5 | 55.2 | 49.6 | 45.0 | 38.7 | 20.1 |
| 3FM225-X | | | 608 | 502 | 438 | 396 | 358 | 330 | 308 | 286 | 268 | 254 | 183 | 147 | 126 | 112 | 91.4 | 79.0 | 67.1 | 58.6 | 52.2 | 47.3 | 43.3 | 36.8 | 19.8 |

(Note) The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

Constant Power Discharge (Watts per cell) at 25°C to 1.80 volts per cell

| Battery Type | 5min | 10min | 15min | 20min | 25min | 30min | 35min | 40min | 45min | 50min | 55min | 1h | 1.5h | 2h | 2.5h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h | 12h | 24h |
|--------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 6FM17-X | 111 | 77.9 | 60.4 | 48.2 | 41.0 | 36.1 | 32.6 | 30.0 | 28.0 | 25.8 | 24.0 | 22.5 | 15.6 | 12.2 | 10.1 | 8.74 | 7.05 | 6.03 | 5.09 | 4.41 | 3.91 | 3.51 | 3.20 | 2.70 | 1.49 |
| 6FM24-X | 112 | 81.5 | 64.0 | 52.2 | 45.0 | 39.5 | 35.8 | 32.2 | 29.5 | 27.5 | 26.2 | 24.5 | 18.7 | 15.1 | 12.9 | 11.4 | 9.40 | 8.00 | 6.98 | 6.29 | 5.60 | 5.18 | 4.82 | 4.10 | 2.31 |
| 6FM33-X | 155 | 116 | 97.9 | 79.5 | 68.4 | 61.0 | 55.8 | 51.8 | 48.8 | 44.6 | 41.2 | 38.3 | 26.8 | 21.0 | 17.5 | 15.2 | 12.6 | 11.0 | 9.37 | 8.18 | 7.28 | 6.59 | 6.03 | 5.13 | 2.76 |
| 6FM40-X | 186 | 140 | 116 | 95.5 | 83.2 | 75.0 | 67.7 | 62.3 | 58.0 | 54.2 | 51.2 | 48.6 | 34.4 | 27.3 | 23.0 | 20.2 | 16.1 | 13.6 | 11.7 | 10.4 | 9.43 | 8.66 | 8.04 | 6.84 | 3.68 |
| 6FM45-X | 203 | 153 | 126 | 103 | 89.2 | 80.0 | 72.7 | 67.3 | 63.0 | 58.7 | 55.2 | 52.3 | 37.2 | 29.6 | 25.0 | 22.0 | 17.1 | 14.2 | 12.2 | 10.8 | 9.73 | 8.90 | 8.24 | 7.01 | 3.77 |
| 6FM55SG-X | 248 | 186 | 154 | 129 | 114 | 104 | 93.0 | 84.8 | 78.4 | 72.6 | 67.9 | 64.0 | 45.4 | 36.0 | 30.4 | 26.7 | 21.2 | 17.9 | 15.3 | 13.5 | 12.1 | 11.1 | 10.2 | 8.65 | 4.66 |
| 6FM60-X | 277 | 205 | 174 | 142 | 122 | 109 | 100 | 93.2 | 87.9 | 81.1 | 75.6 | 71.0 | 50.9 | 40.8 | 34.7 | 30.7 | 24.5 | 20.8 | 17.8 | 15.6 | 14.0 | 12.7 | 11.7 | 10.0 | 5.44 |
| 6FM65-X | 210 | 149 | 121 | 103 | 87.8 | 78.8 | 72.0 | 67.3 | 60.8 | 57.0 | 52.8 | 49.5 | 37.3 | 29.6 | 25.1 | 21.8 | 17.8 | 15.0 | 12.8 | 12.0 | 10.7 | 9.70 | 9.05 | 7.85 | 4.19 |
| 6FM75-X | 341 | 261 | 212 | 176 | 155 | 141 | 126 | 115 | 106 | 97.5 | 90.3 | 84.2 | 61.1 | 49.6 | 42.6 | 38.0 | 30.4 | 25.8 | 21.8 | 18.9 | 16.8 | 15.1 | 13.8 | 11.7 | 6.30 |
| 6FM80-X | 349 | 275 | 218 | 182 | 160 | 146 | 131 | 120 | 111 | 102 | 94.6 | 88.5 | 63.8 | 51.4 | 44.0 | 39.0 | 31.1 | 26.4 | 22.5 | 19.8 | 17.7 | 16.1 | 14.8 | 12.4 | 6.90 |
| 6FM90T-X | | 314 | 267 | 215 | 184 | 163 | 147 | 134 | 125 | 115 | 107 | 101 | 73.1 | 59.1 | 50.8 | 45.2 | 35.9 | 30.3 | 25.8 | 22.5 | 20.1 | 18.2 | 16.7 | 14.2 | 7.66 |
| 6FM100-X | | 329 | 279 | 225 | 193 | 171 | 154 | 141 | 131 | 120 | 112 | 104 | 76.5 | 62.5 | 54.1 | 48.5 | 39.4 | 34.0 | 29.0 | 25.5 | 22.8 | 20.8 | 19.1 | 16.2 | 8.74 |
| 6FM120-X | | 358 | 310 | 254 | 221 | 199 | 178 | 162 | 150 | 140 | 131 | 124 | 88.6 | 70.8 | 60.1 | 53.0 | 43.0 | 37.0 | 32.1 | 28.6 | 26.0 | 23.9 | 22.3 | 19.0 | 10.2 |
| 6FM134-X | | 448 | 391 | 319 | 276 | 247 | 222 | 204 | 189 | 173 | 161 | 150 | 109 | 88.7 | 76.4 | 68.2 | 53.1 | 44.0 | 37.5 | 32.9 | 29.4 | 26.7 | 24.5 | 20.8 | 11.2 |
| 6FM150-X | | 498 | 425 | 357 | 316 | 289 | 260 | 238 | 221 | 203 | 188 | 175 | 128 | 104 | 90.2 | 80.8 | 62.2 | 51.0 | 43.3 | 37.8 | 33.7 | 30.5 | 27.9 | 23.7 | 12.8 |
| 6FM175 | | | 490 | 408 | 359 | 327 | 292 | 266 | 246 | 225 | 209 | 195 | 142 | 116 | 99.8 | 89.4 | 71.1 | 60.2 | 50.9 | 44.2 | 39.3 | 35.4 | 32.3 | 27.7 | 14.4 |
| 6FM200-X | | | 554 | 459 | 402 | 364 | 324 | 294 | 270 | 248 | 230 | 215 | 157 | 127 | 110 | 98.0 | 80.1 | 69.3 | 58.4 | 50.7 | 44.9 | 40.3 | 36.7 | 31.2 | 16.8 |
| 6FM230-X | | | 649 | 552 | 494 | 455 | 411 | 378 | 352 | 325 | 302 | 284 | 205 | 166 | 142 | 126 | 100 | 85.4 | 71.9 | 62.2 | 55.0 | 49.4 | 44.9 | 38.5 | 20.0 |
| 3FM225-X | | | 572 | 481 | 426 | 389 | 352 | 324 | 302 | 278 | 258 | 242 | 176 | 143 | 123 | 110 | 89.4 | 77.0 | 65.6 | 57.4 | 51.3 | 46.5 | 42.7 | 36.3 | 19.5 |

(Note) The above characteristics data are average values obtained within three charge/discharge cycles not the minimum values.

Battery calculations

A. Floating applications

A battery application is characterized by:

- A voltage which must be held within certain limits,
- A power level which must be delivered
- A set capacity to maintain the load in terms of time.

By the use of these three parameters, calculations can be effected as follows:

- A situation requires: a maximum voltage of 490 volts
a minimum voltage of 378 volts
- The ambient temperature is 25°C
- The float voltage is to be 2.27 volts per cell.

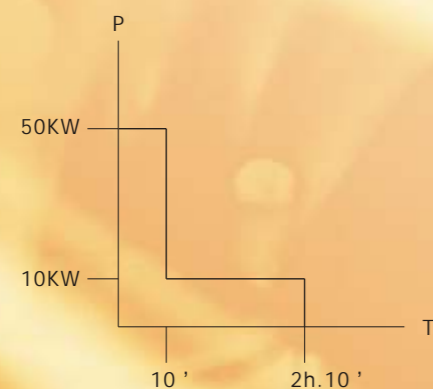
Preliminary calculation:

The maximum number of cells: $490 \text{ V} / 2.27 \text{ V} = 216$ cells

The minimum voltage per cell at the end of discharge:
 $378 \text{ V} / 216 = 1.75$ volts.

Case 1: discharge with a surge at the start of discharge

- The surge power is to be 50 kW for 10 minutes, followed by 10 kW for 2 hours.



Discharge current:

During the surge: $50000 \text{ W} / 378 \text{ V} = 132$ amps

And then: $10000 \text{ W} / 378 \text{ V} = 26$ amps

Determining the cell required for the current required

Current flow during surge:

$(132 \text{ A} \times 10 \text{ min}) / 60 \text{ min} = 22 \text{ Ah}$

Current flow for 2 hours:

$26 \text{ A} \times 2 \text{ h} = 52 \text{ Ah}$

Total capacity drawn: $22 \text{ Ah} + 52 \text{ Ah} = 74 \text{ Ah}$.

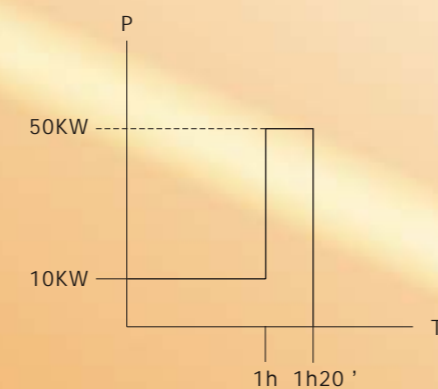
Equivalent discharge time at 26 amps to supply 74 Ah:

$74 / 26 = 2.8$ hours

From the table of performance characteristics, expressed in terms of the discharge current in amps for 1.75V end voltage, the cell to give a current of 26 amps for 2.8 hours is the 6FM100-X.

Conclusion : In this example; it is the total number of Ah required which determines the battery to be used, i.e. 216 cells/36 Batteries of type 6FM100-X.

Case 2: discharge with a surge at the end of discharge (here again, it is the surge which dictates the battery to be used) The continuous power is to be 10 kW for one hour, followed by a surge of 50 kW for 20 minutes



Discharge current:

- During the surge: $50000 \text{ W} / 378 \text{ V} = 132$ amps

- Before the surge: $10000 \text{ W} / 378 \text{ V} = 26$ amps

Capacity drawn in 1 hour: $26 \text{ A} \times 1 \text{ h} = 26 \text{ Ah}$

Capacity drawn during surge (20 min) ($132 \text{ amps} \times 20 \text{ min}$) / 60 min = 43.5 Ah

Total capacity drawn: 69.5 Ah

Equivalent discharge time at 360 amps to supply 26 Ah

$(69.5 / 132) \times 60 \text{ min} = 32 \text{ min}$

From the table of performance characteristics, expressed in terms of the discharge current in amps for 1.75V end voltage, the cell to give a current of 132 amps for 32 minutes is the 6FM150-X.

The battery to be used will consist of 216 cells/36 Batteries of type 6FM150-X.

B) Accidental deep discharge

This may involve discharge of the battery into indicator lamps, a lower load on the battery than that initially planned, a failure of the charging system, a discharged battery not recharged immediately, etc...

On a full discharged battery:

All of the sulphuric acid has been consumed, and the electrolyte is now entirely water.

Sulphation of the plates is at a maximum, thus increasing greatly the internal resistance of the battery. The aqueous solution in which the battery now finds itself can give rise to the development of lead dendrites on the separator during recharging, and this may cause the cell to short-circuit internally.

Important note:

This type of deep discharge will still result in the premature deterioration of the battery, and a significant effect on its life expectancy.

C) Effect of temperature on capacity

The following table gives the correction factor according to temperature, where the reference temperature is 25°C.

| Duration of discharge | Battery temperature | | | | | | | | | | | |
|-----------------------|---------------------|-------|------|------|------|------|------|------|------|------|------|------|
| | -15°C | -10°C | -5°C | 0°C | 5°C | 10°C | 15°C | 20°C | 25°C | 30°C | 35°C | 40°C |
| 15min | 0.46 | 0.52 | 0.58 | 0.65 | 0.71 | 0.78 | 0.85 | 0.93 | 1.00 | 1.07 | 1.15 | 1.22 |
| 1 hour | 0.59 | 0.64 | 0.69 | 0.74 | 0.80 | 0.85 | 0.90 | 0.95 | 1.00 | 1.05 | 1.09 | 1.14 |
| 10hour | 0.71 | 0.75 | 0.79 | 0.82 | 0.86 | 0.90 | 0.93 | 0.97 | 1.00 | 1.03 | 1.06 | 1.08 |



Installation of the battery

Battery storage

Warning:

- The batteries of the VISION FM Series are already charged when delivered, and are fitted with a protective cap on each terminal. They should be unpacked with care.
- Avoid short-circuiting terminals of opposite polarity, because these units are capable of discharging at a very high current especially if the lid or the container is damaged.
- Acid leakage and unusual appearance must be avoided before switching on, noting open circuit voltage.
- There must be appointed man operating for 24 hs after switching on to solving potential problems in time, noting voltage and current.

Unpacking the battery

- Each shipment of VISION FM Series batteries is accompanied by a packing list.
- The packing list should be checked, and the Sales Department should be told immediately of any missing items.

Setting up the battery racks

- The structure should be assembled in accordance with instructions supplied with the equipment.

Racks

- Ensure that the stretchers and cross-members are correctly interlinked.
- Take up any irregularity in floor surface using shims
- Ensure that all frame members are correctly interlinked
- Use the adjustable feet to take up irregularities in the floor surface
- Metal racks should always be connected to the building earth in accordance with current regulations.

Mounting in a cabinet

Ensure that the cabinet:

- Is sufficiently strong to cope with the weight of the battery-
- is covered with a layer of insulation
- Is naturally ventilated.

Connection of cells

All connections should be insulated

In series:

The number of cells in series will determine the total float of voltage:

$$U = v \times N$$

Total float Voltage = Float voltage for one cell x Number of cells

In parallel:

FM batteries of the same Ah rating may be connected in parallel to give higher current capability. This connection in parallel will be preferably carried out through an equipotential wiring for an equal current distribution in each string.

There is no technical reason for limiting the number of strings but for practical installation reasons. It is recommended not allowed to exceed 3 strings in parallel especially if the battery is used in high discharge rates (backup time less than 15 mins)

General recommendations

- Do not wear clothing of synthetic material, to avoid the generation of static potentials.
- Use insulated tools.
- Place the cells beginning with the least accessible rows, spacing the cells as shown on the drawing.
- Consult the drawing for the correct position of the battery poles (positive=red colour, negative = Black colour).
- Before attaching the inter-cell flexible cables, check that all terminals are in the correct position.
- The battery cells are connected in series, which is with a positive pole connected to a negative pole.
- Use only a damp cotton cloth for cleaning purposes
- Tighten the nuts or bolts to the recommended levels of torque indicated on the product label. Always use insulated tools for fitting and torque up battery connections.

Safety:

All installations must comply with the current regulations and norms.

Storage conditions :

The battery should be stored away from any moisture or source of heat.

Storage times :

The self-discharge of VISION FM Series batteries as a function of temperature is as follows :

- 3 % per month at 20°C
- 6 % per month at 30°C
- 10 % per month at 40°C

In order to ensure that the battery can be charged easily after a long period of storage, it is recommended that batteries should not be stored for more than the following periods without recharging :

- 6 months at 20°C
- 4 months at 30°C
- 2 months at 40°C

Failure to comply with these recommendations may compromise the life expectancy of the battery.

Commissioning

- Ensure that batteries are kept at all times in clean and dry conditions.

Maintenance

- Check the tightening of connections.
- Every month, it is recommended that the total voltage at the battery terminals be measured. It should be $N \times 2.23 - 2.28 / V$ at a temperature of 25°C, where N is the number of cells in the battery.
- Once each year, it is recommended that the voltage of each cell in the battery should be read off.
- A difference of plus or minus 2.0% between these individual voltages and the average voltage may be observed. This is due to the gas- recombination process.
- A check on capacity (independent operation on load) can be performed once or twice per year.
- Safety :When carrying out any work on the battery, the applicable safety standards should be followed.

Determining the state of charge of the battery

The state of charge of the battery can be determined by measuring the off-load voltage after the battery has been allowed to rest for 24 hours.

| % of capacity at 20°C | Voltage per cell at different temperatures | | | | |
|-----------------------|--------------------------------------------|------|------|------|------|
| | 0°C | 10°C | 20°C | 30°C | 40°C |
| 100% | 2,16 | 2,15 | 2,14 | 2,13 | 2,13 |
| 80% | 2,09 | 2,09 | 2,09 | 2,09 | 2,09 |
| 60% | 2,06 | 2,06 | 2,06 | 2,06 | 2,06 |
| 40% | 2,02 | 2,02 | 2,02 | 2,02 | 2,02 |
| 20% | 1,97 | 1,97 | 1,97 | 1,97 | 1,97 |

Recharging stored batteries

The batteries should be recharged at the float charge voltage to suit the temperature 2.23-2.28 volts at 25°C per cell for a minimum period of 96 hours.

The battery will be charged when the charging current has remained constant for a period of 3 hours.

- Before commissioning, the batteries must be charged at a constant regulated voltage to match the prevailing temperature for a minimum period of 48 hours.

Note : it is recommended that a battery log be maintained, and that records should be kept of the total voltage measurements, any mains failures, major battery discharges (current and time) etc.
The main factors causing reduction in the life expectancy of VISION FM Series cells :

- Deep discharges
- Poor regulation on the float voltage
- Cycling or micro
- Cycling- poor quality (smoothing) of the charging current
- High ambient temperature.