

# ALUMINUM ELECTROLYTIC CAPACITORS



**NR** series Screw Terminal Type, 85°C Standard



- Load life of 5000 hours application of rated ripple current at 85°C.
- Extended range up to  $\phi 100 \times 250L$  size.
- Compliant to the RoHS directive (2002/95/EC).



## Specifications

| Item  | Performance Characteristics  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|---|--|--------------------|--|--------------|---|-----------------|---|-------------------|-------------------|------------|-----|------------|----|-----------|-----|-----|------|-----|------|------|-----|------|------|-----|-----|------|-----|-----|------|------|-----|------|------|----|-----------|-----|-----|------|------|------|------|-----|------|------|------------|-----|-----|-----|-----|-----|------|-----|------|------|------|-----|-----|---|---|-----|------|-----|------|---|-----|------------|-----|------|------|---|---|-----|-----|-----|-----|------|-----|-----|---|---|------|---|---|---|---|-----|------------|-----|-----|------|------|------|-----|------|-----|-----|----|------------|-----|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|------|
| Category Temperature Range                  | - 40 to +85°C (10 to 100V) , - 25 to +85°C (160 to 250V)   |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Rated Voltage Range                         | 10 to 250V   |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Rated Capacitance Range                     | 1000 to 2200000 $\mu$ F  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Capacitance Tolerance                       | $\pm 20\%$ at 120Hz, 20°C  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Leakage Current                             | After 5 minutes' application of rated voltage, leakage current is not more than $3\sqrt{CV}$ ( $\mu$ A) or 5 mA, whichever is smaller (at 20°C) .<br>[C:Rated Capacitance ( $\mu$ F) , V:Voltage(V)]   |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Tangent of loss angle (tan $\delta$ ) (MAX) | <table border="1"> <thead> <tr> <th><math>\phi</math></th> <th>V</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>80</th> <th>100</th> <th>160 to 250</th> </tr> </thead> <tbody> <tr> <td rowspan="2">35</td> <td>80 to 100</td> <td>0.6</td> <td>0.4</td> <td>0.35</td> <td>0.3</td> <td>0.25</td> <td>0.25</td> <td>0.2</td> <td>0.12</td> <td>0.15</td> </tr> <tr> <td>120</td> <td>0.7</td> <td>0.55</td> <td>0.4</td> <td>0.3</td> <td>0.25</td> <td>0.25</td> <td>0.2</td> <td>0.15</td> <td>0.15</td> </tr> <tr> <td rowspan="2">51</td> <td>70 to 100</td> <td>0.9</td> <td>0.6</td> <td>0.45</td> <td>0.35</td> <td>0.25</td> <td>0.25</td> <td>0.2</td> <td>0.15</td> <td>0.15</td> </tr> <tr> <td>120 to 140</td> <td>1.0</td> <td>0.8</td> <td>0.5</td> <td>0.4</td> <td>0.3</td> <td>0.25</td> <td>0.2</td> <td>0.15</td> <td>0.15</td> </tr> <tr> <td rowspan="2">63.5</td> <td>100</td> <td>0.9</td> <td>—</td> <td>—</td> <td>0.5</td> <td>0.35</td> <td>0.3</td> <td>0.25</td> <td>—</td> <td>0.2</td> </tr> <tr> <td>120 to 140</td> <td>1.2</td> <td>0.75</td> <td>0.65</td> <td>—</td> <td>—</td> <td>0.3</td> <td>0.3</td> <td>0.2</td> <td>0.2</td> </tr> <tr> <td rowspan="2">76.2</td> <td>100</td> <td>1.6</td> <td>—</td> <td>—</td> <td>0.65</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>0.2</td> </tr> <tr> <td>120 to 140</td> <td>1.6</td> <td>1.1</td> <td>0.75</td> <td>0.75</td> <td>0.55</td> <td>0.5</td> <td>0.35</td> <td>0.3</td> <td>0.2</td> </tr> <tr> <td>90</td> <td>140 to 220</td> <td>2.0</td> <td>1.5</td> <td>1.0</td> <td>0.9</td> <td>0.75</td> <td>0.6</td> <td>0.4</td> <td>0.3</td> <td>0.25</td> </tr> <tr> <td>100</td> <td>250</td> <td>2.4</td> <td>1.5</td> <td>1.0</td> <td>0.9</td> <td>0.75</td> <td>0.6</td> <td>0.4</td> <td>0.3</td> <td>0.25</td> </tr> </tbody> </table> <p>Measurement frequency: 120Hz at 20°C</p> | $\phi$             | V  | 10           | 16  | 25              | 35  | 50                | 63                | 80         | 100 | 160 to 250 | 35 | 80 to 100 | 0.6 | 0.4 | 0.35 | 0.3 | 0.25 | 0.25 | 0.2 | 0.12 | 0.15 | 120 | 0.7 | 0.55 | 0.4 | 0.3 | 0.25 | 0.25 | 0.2 | 0.15 | 0.15 | 51 | 70 to 100 | 0.9 | 0.6 | 0.45 | 0.35 | 0.25 | 0.25 | 0.2 | 0.15 | 0.15 | 120 to 140 | 1.0 | 0.8 | 0.5 | 0.4 | 0.3 | 0.25 | 0.2 | 0.15 | 0.15 | 63.5 | 100 | 0.9 | — | — | 0.5 | 0.35 | 0.3 | 0.25 | — | 0.2 | 120 to 140 | 1.2 | 0.75 | 0.65 | — | — | 0.3 | 0.3 | 0.2 | 0.2 | 76.2 | 100 | 1.6 | — | — | 0.65 | — | — | — | — | 0.2 | 120 to 140 | 1.6 | 1.1 | 0.75 | 0.75 | 0.55 | 0.5 | 0.35 | 0.3 | 0.2 | 90 | 140 to 220 | 2.0 | 1.5 | 1.0 | 0.9 | 0.75 | 0.6 | 0.4 | 0.3 | 0.25 | 100 | 250 | 2.4 | 1.5 | 1.0 | 0.9 | 0.75 | 0.6 | 0.4 | 0.3 | 0.25 |
| $\phi$                                      | V  | 10                 | 16   | 25           | 35  | 50              | 63  | 80                | 100               | 160 to 250 |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| 35  | 80 to 100  | 0.6                | 0.4  | 0.35         | 0.3   | 0.25            | 0.25  | 0.2               | 0.12              | 0.15       |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|   | 120  | 0.7                | 0.55   | 0.4          | 0.3   | 0.25            | 0.25  | 0.2               | 0.15              | 0.15       |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| 51  | 70 to 100  | 0.9                | 0.6  | 0.45         | 0.35  | 0.25            | 0.25  | 0.2               | 0.15              | 0.15       |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|   | 120 to 140   | 1.0                | 0.8  | 0.5          | 0.4   | 0.3             | 0.25  | 0.2               | 0.15              | 0.15       |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| 63.5  | 100  | 0.9                | —  | —            | 0.5   | 0.35            | 0.3   | 0.25              | —                 | 0.2        |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|   | 120 to 140   | 1.2                | 0.75   | 0.65         | —   | —               | 0.3   | 0.3               | 0.2               | 0.2        |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| 76.2  | 100  | 1.6                | —  | —            | 0.65  | —               | —   | —                 | —                 | 0.2        |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|   | 120 to 140   | 1.6                | 1.1  | 0.75         | 0.75  | 0.55            | 0.5   | 0.35              | 0.3               | 0.2        |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| 90  | 140 to 220   | 2.0                | 1.5  | 1.0          | 0.9   | 0.75            | 0.6   | 0.4               | 0.3               | 0.25       |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| 100   | 250  | 2.4                | 1.5  | 1.0          | 0.9   | 0.75            | 0.6   | 0.4               | 0.3               | 0.25       |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Stability at Low Temperature                | <table border="1"> <thead> <tr> <th rowspan="2">Rated voltage(V)</th> <th colspan="2">Measurement frequency : 120Hz</th> </tr> <tr> <th>10 to 100</th> <th>160 to 250</th> </tr> </thead> <tbody> <tr> <td>Impedance ratio ZT/Z20(MAX.)</td> <td>Z - 40°C / Z+20°C</td> <td>Z - 25°C / Z+20°C</td> </tr> <tr> <td></td> <td>12</td> <td>8</td> </tr> </tbody> </table>   | Rated voltage(V)   | Measurement frequency : 120Hz                      |              | 10 to 100                                     | 160 to 250      | Impedance ratio ZT/Z20(MAX.)                      | Z - 40°C / Z+20°C | Z - 25°C / Z+20°C |            | 12  | 8          |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Rated voltage(V)                            | Measurement frequency : 120Hz  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|   | 10 to 100  | 160 to 250         |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Impedance ratio ZT/Z20(MAX.)                | Z - 40°C / Z+20°C  | Z - 25°C / Z+20°C  |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
|   | 12   | 8                  |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Endurance                                   | <p>The specifications listed at right shall be met when the capacitors are restored to 20°C after D.C. bias plus rated ripple current is applied for 5000 hours at 85°C, the peak voltage shall not exceed the rated voltage.</p> <table border="1"> <tr> <td>Capacitance change</td> <td>Within <math>\pm 15\%</math> of the initial capacitance value</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>175% or less than the initial specified value</td> </tr> <tr> <td>Leakage current</td> <td>Less than or equal to the initial specified value</td> </tr> </table>  | Capacitance change | Within $\pm 15\%$ of the initial capacitance value | tan $\delta$ | 175% or less than the initial specified value | Leakage current | Less than or equal to the initial specified value |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Capacitance change                          | Within $\pm 15\%$ of the initial capacitance value   |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| tan $\delta$                                | 175% or less than the initial specified value  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Leakage current                             | Less than or equal to the initial specified value  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Shelf Life                                  | <p>After storing the capacitors under no load at 85°C for 1000 hours and then performing voltage treatment based on JIS C 5101-4 clause 4.1 at 20°C, they shall meet the requirements listed at right.</p> <table border="1"> <tr> <td>Capacitance change</td> <td>Within <math>\pm 20\%</math> of the initial capacitance value</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>175% or less than the initial specified value</td> </tr> <tr> <td>Leakage current</td> <td>Less than or equal to the initial specified value</td> </tr> </table>   | Capacitance change | Within $\pm 20\%$ of the initial capacitance value | tan $\delta$ | 175% or less than the initial specified value | Leakage current | Less than or equal to the initial specified value |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Capacitance change                          | Within $\pm 20\%$ of the initial capacitance value   |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| tan $\delta$                                | 175% or less than the initial specified value  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Leakage current                             | Less than or equal to the initial specified value  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |
| Marking                                     | Printed with black color letter on light blue sleeve.  |                    |  |              |   |                 |   |                   |                   |            |     |            |    |           |     |     |      |     |      |      |     |      |      |     |     |      |     |     |      |      |     |      |      |    |           |     |     |      |      |      |      |     |      |      |            |     |     |     |     |     |      |     |      |      |      |     |     |   |   |     |      |     |      |   |     |            |     |      |      |   |   |     |     |     |     |      |     |     |   |   |      |   |   |   |   |     |            |     |     |      |      |      |     |      |     |     |    |            |     |     |     |     |      |     |     |     |      |     |     |     |     |     |     |      |     |     |     |      |

## Drawing

$\phi 35$  Screw terminal type



## Type numbering system (Example : 250V 2200 $\mu$ F)



Please refer to page 282 for schematic of dimensions.  
 ※ Please contact to us if PVCless products are required.

● Dimension table in next page.

## NR series

Screw terminal types for  $\phi 51$  and larger



**Note:**  
 Capacitors with body dia.  $\phi 51$  or larger are furnished with 3-leg brackets shown above as standard.  
 If these capacitors are preferred to have 2-leg brackets as shown right, add "B" in the 12th digit of type numbering system.

● Dimension of terminal pitch (W) and length ( $\ell$ ) and Nominal dia. of bolt (mm)

| $\phi D$ | W    | $\ell$ | $\alpha$ | Nominal dia. of bolt |
|----------|------|--------|----------|----------------------|
| 51       | 22.0 | 6      | 3        | M5                   |
| 63.5     | 28.6 | 6      | 3        | M5                   |
| 76.2     | 31.8 | 6      | 3        | M5                   |
| 90       | 31.8 | 6      | 3        | M5                   |
| 100      | 41.5 | 10     | 4        | M8                   |

● Dimensions of mounting bracket (mm)

| Symbol         | Leg Shape $\phi D$ |      |      |      |      |        |      |      |     |  |
|----------------|--------------------|------|------|------|------|--------|------|------|-----|--|
|                | 3-Legs             |      |      |      |      | 2-Legs |      |      |     |  |
|                | 51                 | 63.5 | 76.2 | 90   | 100  | 51     | 63.5 | 76.2 | 90  |  |
| P              | 32.5               | 38.1 | 44.5 | 50.8 | 56.3 | 33.2   | 40.5 | 46.5 | 53  |  |
| A              | 38.5               | 43   | 49.2 | 58.5 | 62   | 40     | 46.5 | 53   | 59  |  |
| T              | 7.5                | 8.0  | 7.0  | 8.0  | 8.0  | 6.0    | 7.0  | 6.0  | 6.0 |  |
| S              | 5.0                | 5.0  | 5.0  | 5.0  | 5.0  | 4.5    | 4.5  | 4.5  | 4.5 |  |
| U              | 12                 | 14   | 14   | 18   | 16   | 14     | 14   | 14   | 14  |  |
| $\theta^\circ$ | 60                 | 60   | 60   | 60   | 60   | 30     | 30   | 30   | 30  |  |
| H              | 20                 | 25   | 30   | 35   | 36   | 25     | 35   | 35   | 35  |  |
| h              | 15                 | 20   | 24   | 25   | 30   | 15     | 20   | 20   | 20  |  |

■ Dimensions

| 10V (1A)         |                             |                     |               |                      |             |
|------------------|-----------------------------|---------------------|---------------|----------------------|-------------|
| Cap. ( $\mu F$ ) | Size $\phi D \times L$ (mm) | Rated ripple (Arms) | $\tan \delta$ | Leakage Current (mA) | Code        |
| 47000            | 35×80                       | 6.0                 | 0.60          | 2.05                 | LNR1A473MSE |
| 68000            | 35×80                       | 7.2                 | 0.60          | 2.47                 | LNR1A683MSE |
| 100000           | 35×100                      | 8.8                 | 0.60          | 3.00                 | LNR1A104MSE |
| 150000           | 51×80                       | 10.7                | 0.90          | 3.67                 | LNR1A154MSE |
| 220000           | 51×100                      | 13.0                | 0.90          | 4.44                 | LNR1A224MSE |
| 330000           | 63.5×100                    | 15.9                | 0.90          | 5.00                 | LNR1A334MSE |
| 470000           | 63.5×120                    | 19.0                | 1.20          | 5.00                 | LNR1A474MSE |
| 680000           | 76.2×120                    | 22.8                | 1.60          | 5.00                 | LNR1A684MSE |
| 1000000          | 90×170                      | 27.7                | 2.00          | 5.00                 | LNR1A105MSE |
| 1500000          | 90×220                      | 33.9                | 2.00          | 5.00                 | LNR1A155MSE |
| 2200000          | 100×250                     | 41.1                | 2.40          | 5.00                 | LNR1A225MSE |

| 16V (1C)         |                             |                     |               |                      |             |
|------------------|-----------------------------|---------------------|---------------|----------------------|-------------|
| Cap. ( $\mu F$ ) | Size $\phi D \times L$ (mm) | Rated ripple (Arms) | $\tan \delta$ | Leakage Current (mA) | Code        |
| 47000            | 35×80                       | 6.4                 | 0.40          | 2.60                 | LNR1C473MSE |
| 68000            | 35×100                      | 7.9                 | 0.40          | 3.12                 | LNR1C683MSE |
| 100000           | 35×120                      | 10.6                | 0.55          | 3.79                 | LNR1C104MSE |
| 150000           | 51×100                      | 11.5                | 0.60          | 4.64                 | LNR1C154MSE |
| 220000           | 51×120                      | 15.6                | 0.80          | 5.00                 | LNR1C224MSE |
| 330000           | 63.5×120                    | 25.1                | 0.75          | 5.00                 | LNR1C334MSE |
| 470000           | 76.2×120                    | 30.5                | 1.10          | 5.00                 | LNR1C474MSE |
| 680000           | 90×170                      | 33.0                | 1.50          | 5.00                 | LNR1C684MSE |
| 1000000          | 90×220                      | 36.0                | 1.50          | 5.00                 | LNR1C105MSE |
| 1500000          | 100×250                     | 39.7                | 1.50          | 5.00                 | LNR1C155MSE |

Rated ripple current (Arms) at 85°C 120Hz

### ■Dimensions

| 25V (1E)  |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 33000     | 35×80           | 6.2                 | 0.35  | 2.72                 | LNR1E333MSE |
| 47000     | 35×100          | 8.2                 | 0.35  | 3.25                 | LNR1E473MSE |
| 68000     | 35×120          | 9.4                 | 0.40  | 3.91                 | LNR1E683MSE |
| 100000    | 51×100          | 12.0                | 0.45  | 4.74                 | LNR1E104MSE |
| 150000    | 51×120          | 15.3                | 0.50  | 5.00                 | LNR1E154MSE |
| 220000    | 63.5×120        | 18.9                | 0.65  | 5.00                 | LNR1E224MSE |
| 330000    | 76.2×120        | 24.8                | 0.75  | 5.00                 | LNR1E334MSE |
| 470000    | 90×170          | 30.8                | 1.00  | 5.00                 | LNR1E474MSE |
| 680000    | 90×220          | 33.3                | 1.00  | 5.00                 | LNR1E684MSE |
| 1000000   | 100×250         | 36.4                | 1.00  | 5.00                 | LNR1E105MSE |

| 35V (1V)  |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 33000     | 35×80           | 6.2                 | 0.30  | 3.22                 | LNR1V333MSE |
| 47000     | 35×120          | 8.2                 | 0.30  | 3.84                 | LNR1V473MSE |
| 68000     | 51×80           | 9.3                 | 0.35  | 4.62                 | LNR1V683MSE |
| 100000    | 51×120          | 13.6                | 0.40  | 5.00                 | LNR1V104MSE |
| 150000    | 63.5×100        | 14.5                | 0.50  | 5.00                 | LNR1V154MSE |
| 220000    | 76.2×100        | 16.8                | 0.65  | 5.00                 | LNR1V224MSE |
| 330000    | 76.2×140        | 24.8                | 0.75  | 5.00                 | LNR1V334MSE |
| 470000    | 90×170          | 32.6                | 0.90  | 5.00                 | LNR1V474MSE |
| 680000    | 90×220          | 35.2                | 0.90  | 5.00                 | LNR1V684MSE |
| 1000000   | 100×250         | 38.5                | 0.90  | 5.00                 | LNR1V105MSE |

| 50V (1H)  |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 15000     | 35×80           | 5.4                 | 0.25  | 2.59                 | LNR1H153MSE |
| 22000     | 35×100          | 6.1                 | 0.25  | 3.14                 | LNR1H223MSE |
| 33000     | 51×70           | 7.0                 | 0.25  | 3.85                 | LNR1H333MSE |
| 47000     | 51×90           | 8.6                 | 0.25  | 4.59                 | LNR1H473MSE |
| 68000     | 51×100          | 11.0                | 0.25  | 5.00                 | LNR1H683MSE |
| 100000    | 63.5×100        | 14.2                | 0.35  | 5.00                 | LNR1H104MSE |
| 150000    | 76.2×120        | 18.6                | 0.55  | 5.00                 | LNR1H154MSE |
| 220000    | 90×140          | 20.3                | 0.75  | 5.00                 | LNR1H224MSE |
| 330000    | 90×170          | 25.3                | 0.75  | 5.00                 | LNR1H334MSE |
| 470000    | 90×220          | 33.2                | 0.75  | 5.00                 | LNR1H474MSE |
| 680000    | 100×250         | 36.0                | 0.75  | 5.00                 | LNR1H684MSE |

| 63V (1J)  |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 10000     | 35×80           | 4.1                 | 0.25  | 2.38                 | LNR1J103MSE |
| 15000     | 35×100          | 5.5                 | 0.25  | 2.91                 | LNR1J153MSE |
| 22000     | 35×120          | 7.1                 | 0.25  | 3.53                 | LNR1J223MSE |
| 33000     | 51×80           | 8.8                 | 0.25  | 4.32                 | LNR1J333MSE |
| 47000     | 51×120          | 11.7                | 0.25  | 5.00                 | LNR1J473MSE |
| 68000     | 63.5×100        | 15.0                | 0.30  | 5.00                 | LNR1J683MSE |
| 100000    | 63.5×140        | 20.8                | 0.30  | 5.00                 | LNR1J104MSE |
| 150000    | 76.2×140        | 26.0                | 0.50  | 5.00                 | LNR1J154MSE |
| 220000    | 90×170          | 28.3                | 0.60  | 5.00                 | LNR1J224MSE |
| 330000    | 90×220          | 31.2                | 0.60  | 5.00                 | LNR1J334MSE |
| 470000    | 100×250         | 33.6                | 0.60  | 5.00                 | LNR1J474MSE |

| 80V (1K)  |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 10000     | 35×80           | 4.2                 | 0.20  | 2.68                 | LNR1K103MSE |
| 15000     | 35×120          | 6.0                 | 0.20  | 3.28                 | LNR1K153MSE |
| 22000     | 51×80           | 6.5                 | 0.20  | 3.97                 | LNR1K223MSE |
| 33000     | 51×120          | 9.2                 | 0.20  | 4.87                 | LNR1K333MSE |
| 47000     | 63.5×100        | 12.7                | 0.25  | 5.00                 | LNR1K473MSE |
| 68000     | 63.5×140        | 15.5                | 0.30  | 5.00                 | LNR1K683MSE |
| 100000    | 76.2×140        | 21.3                | 0.35  | 5.00                 | LNR1K104MSE |
| 150000    | 90×170          | 26.5                | 0.40  | 5.00                 | LNR1K154MSE |
| 220000    | 90×220          | 28.9                | 0.40  | 5.00                 | LNR1K224MSE |
| 330000    | 100×250         | 31.8                | 0.40  | 5.00                 | LNR1K334MSE |

| 100V (2A) |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 4700      | 35×80           | 3.8                 | 0.12  | 2.05                 | LNR2A472MSE |
| 6800      | 35×100          | 4.5                 | 0.12  | 2.47                 | LNR2A682MSE |
| 10000     | 35×120          | 5.3                 | 0.15  | 3.00                 | LNR2A103MSE |
| 15000     | 51×80           | 6.0                 | 0.15  | 3.67                 | LNR2A153MSE |
| 22000     | 51×100          | 6.8                 | 0.15  | 4.45                 | LNR2A223MSE |
| 33000     | 51×140          | 10.0                | 0.15  | 5.00                 | LNR2A333MSE |
| 47000     | 63.5×140        | 14.4                | 0.20  | 5.00                 | LNR2A473MSE |
| 68000     | 76.2×140        | 18.2                | 0.30  | 5.00                 | LNR2A683MSE |
| 100000    | 90×170          | 22.1                | 0.30  | 5.00                 | LNR2A104MSE |
| 150000    | 90×220          | 27.0                | 0.30  | 5.00                 | LNR2A154MSE |
| 220000    | 100×250         | 32.7                | 0.30  | 5.00                 | LNR2A224MSE |

Rated ripple current (Arms) at 85°C, 120Hz

## NR series

### ■Dimensions

| 160V (2C) |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 2200      | 35×80           | 3.2                 | 0.15  | 1.77                 | LNR2C222MSE |
| 3300      | 35×120          | 4.7                 | 0.15  | 2.17                 | LNR2C332MSE |
| 4700      | 51×80           | 5.0                 | 0.15  | 2.60                 | LNR2C472MSE |
| 6800      | 51×100          | 6.4                 | 0.15  | 3.12                 | LNR2C682MSE |
| 10000     | 63.5×100        | 9.1                 | 0.20  | 3.79                 | LNR2C103MSE |
| 15000     | 76.2×100        | 12.0                | 0.20  | 4.64                 | LNR2C153MSE |
| 22000     | 76.2×140        | 16.9                | 0.20  | 5.00                 | LNR2C223MSE |
| 33000     | 90×140          | 19.2                | 0.25  | 5.00                 | LNR2C333MSE |
| 47000     | 90×170          | 20.6                | 0.25  | 5.00                 | LNR2C473MSE |
| 68000     | 90×220          | 22.3                | 0.25  | 5.00                 | LNR2C683MSE |
| 100000    | 100×250         | 24.4                | 0.25  | 5.00                 | LNR2C104MSE |

| 200V (2D) |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 1500      | 35×80           | 2.9                 | 0.15  | 1.64                 | LNR2D152MSE |
| 2200      | 35×100          | 3.5                 | 0.15  | 1.99                 | LNR2D222MSE |
| 3300      | 51×80           | 4.8                 | 0.15  | 2.43                 | LNR2D332MSE |
| 4700      | 51×100          | 6.3                 | 0.15  | 2.90                 | LNR2D472MSE |
| 6800      | 51×140          | 7.3                 | 0.15  | 3.49                 | LNR2D682MSE |
| 10000     | 63.5×120        | 9.8                 | 0.20  | 4.24                 | LNR2D103MSE |
| 15000     | 76.2×120        | 13.0                | 0.20  | 5.00                 | LNR2D153MSE |
| 22000     | 90×140          | 15.9                | 0.25  | 5.00                 | LNR2D223MSE |
| 33000     | 90×170          | 19.5                | 0.25  | 5.00                 | LNR2D333MSE |
| 47000     | 90×220          | 20.9                | 0.25  | 5.00                 | LNR2D473MSE |
| 68000     | 100×250         | 22.6                | 0.25  | 5.00                 | LNR2D683MSE |

| 250V (2E) |                 |                     |       |                      |             |
|-----------|-----------------|---------------------|-------|----------------------|-------------|
| Cap. (μF) | Size φD × L(mm) | Rated ripple (Arms) | tan δ | Leakage Current (mA) | Code        |
| 1000      | 35×80           | 2.4                 | 0.15  | 1.50                 | LNR2E102MSE |
| 1500      | 35×100          | 3.0                 | 0.15  | 1.83                 | LNR2E152MSE |
| 2200      | 51×80           | 4.0                 | 0.15  | 2.22                 | LNR2E222MSE |
| 3300      | 51×100          | 5.4                 | 0.15  | 2.72                 | LNR2E332MSE |
| 4700      | 63.5×100        | 7.3                 | 0.20  | 3.25                 | LNR2E472MSE |
| 6800      | 63.5×120        | 8.9                 | 0.20  | 3.91                 | LNR2E682MSE |
| 10000     | 76.2×120        | 11.8                | 0.20  | 4.74                 | LNR2E103MSE |
| 15000     | 90×140          | 16.4                | 0.25  | 5.00                 | LNR2E153MSE |
| 22000     | 90×170          | 17.9                | 0.25  | 5.00                 | LNR2E223MSE |
| 33000     | 90×220          | 19.7                | 0.25  | 5.00                 | LNR2E333MSE |
| 47000     | 100×250         | 21.2                | 0.25  | 5.00                 | LNR2E473MSE |

Rated ripple current (Arms) at 85°C, 120Hz

### ●Frequency coefficient of rated ripple current

| Coeff.      | Frequency (Hz) | 60   | 120  | 360  | 1k   | 10k or more |
|-------------|----------------|------|------|------|------|-------------|
|             | 10 to 100V     | 0.90 | 1.00 | 1.08 | 1.15 | 1.15        |
| 160 to 250V | 0.88           | 1.00 | 1.08 | 1.15 | 1.20 |             |



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### Наши контакты:

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331