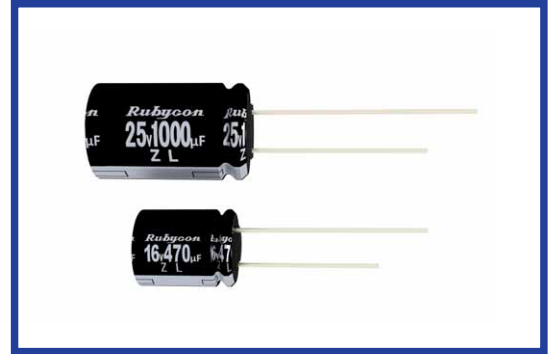


**ZL SERIES**

**105°C High Ripple Current, Low Impedance**

\*Load Life : 105°C 1000~5000 hours.



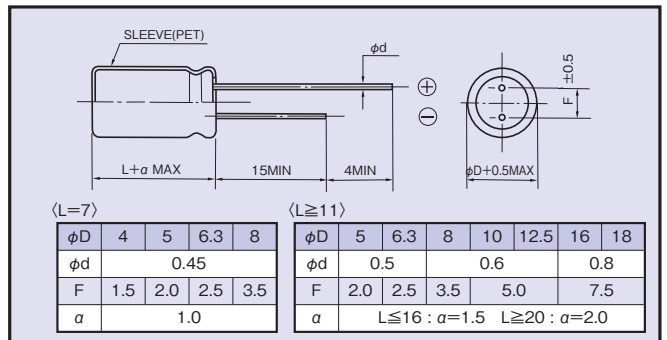
**◆ SPECIFICATIONS**

| Items  | Characteristics   |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
|--|---|--|-----------------------------------|--|-----------------|-----------------|------|------|---------------|--------|---------------|------------------|------|--------|------|---------|------|--------------------|--|-----------------|------------------------------------|------------------|---|---|---|---|---|---|---|---|--|
| Category Temperature Range                     | -40~+105°C  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Rated Voltage Range                            | 6.3~100Vdc  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Capacitance Tolerance                          | ±20% (20°C, 120Hz)  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Leakage Current(MAX)                           | I=0.01CV or 3µA whichever is greater.(After 2 minutes)<br>I=Leakage Current(µA)      C=Capacitance(µF)      V=Rated Voltage(Vdc)  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Dissipation Factor(MAX) (tanδ)                 | <table border="1"> <tr> <td>Rated Voltage (Vdc)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> <td>(20°C, 120Hz)</td> </tr> <tr> <td>tanδ</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> <td>0.08</td> <td></td> </tr> </table> <p>When capacitance is over 1000µF, tanδ shall be added 0.02 to the listed value with increase of every 1000µF.</p>   | Rated Voltage (Vdc)  | 6.3                               | 10   | 16              | 25              | 35   | 50   | 63            | 100    | (20°C, 120Hz) | tanδ             | 0.22 | 0.19   | 0.16 | 0.14    | 0.12 | 0.10               | 0.09                                       | 0.08            |                                    |                  |   |   |   |   |   |   |   |   |  |
| Rated Voltage (Vdc)                            | 6.3   | 10   | 16                                | 25   | 35              | 50              | 63   | 100  | (20°C, 120Hz) |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| tanδ   | 0.22  | 0.19   | 0.16                              | 0.14   | 0.12            | 0.10            | 0.09 | 0.08 |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Endurance                                      | <p>After applying rated voltage with rated ripple current for specified time at 105°C, the capacitors shall meet the following requirements.</p> <table border="1"> <tr> <td>Capacitance Change</td> <td>Within ±25% of the initial value.</td> <td rowspan="3"> <table border="1"> <tr> <th>Case Size</th> <th>Life Time (hrs)</th> </tr> <tr> <td>L=7</td> <td>1000</td> </tr> <tr> <td rowspan="4">L≥11</td> <td>φD≤6.3</td> <td>2000</td> </tr> <tr> <td>φD= 8</td> <td>3000</td> </tr> <tr> <td>φD= 10</td> <td>4000</td> </tr> <tr> <td>φD≥12.5</td> <td>5000</td> </tr> </table> </td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than 200% of the specified value.</td> </tr> <tr> <td>Leakage Current</td> <td>Not more than the specified value.</td> </tr> </table> | Capacitance Change   | Within ±25% of the initial value. | <table border="1"> <tr> <th>Case Size</th> <th>Life Time (hrs)</th> </tr> <tr> <td>L=7</td> <td>1000</td> </tr> <tr> <td rowspan="4">L≥11</td> <td>φD≤6.3</td> <td>2000</td> </tr> <tr> <td>φD= 8</td> <td>3000</td> </tr> <tr> <td>φD= 10</td> <td>4000</td> </tr> <tr> <td>φD≥12.5</td> <td>5000</td> </tr> </table> | Case Size       | Life Time (hrs) | L=7  | 1000 | L≥11          | φD≤6.3 | 2000          | φD= 8            | 3000 | φD= 10 | 4000 | φD≥12.5 | 5000 | Dissipation Factor | Not more than 200% of the specified value. | Leakage Current | Not more than the specified value. |                  |   |   |   |   |   |   |   |   |  |
| Capacitance Change                             | Within ±25% of the initial value.   | <table border="1"> <tr> <th>Case Size</th> <th>Life Time (hrs)</th> </tr> <tr> <td>L=7</td> <td>1000</td> </tr> <tr> <td rowspan="4">L≥11</td> <td>φD≤6.3</td> <td>2000</td> </tr> <tr> <td>φD= 8</td> <td>3000</td> </tr> <tr> <td>φD= 10</td> <td>4000</td> </tr> <tr> <td>φD≥12.5</td> <td>5000</td> </tr> </table> | Case Size                         |  | Life Time (hrs) | L=7             | 1000 | L≥11 |               | φD≤6.3 | 2000          | φD= 8            | 3000 | φD= 10 | 4000 | φD≥12.5 | 5000 |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Case Size                                      | Life Time (hrs)   |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| L=7  | 1000  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| L≥11   | φD≤6.3  | 2000   |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
|  | φD= 8   | 3000   |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
|  | φD= 10  | 4000   |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
|  | φD≥12.5   | 5000   |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Dissipation Factor                             | Not more than 200% of the specified value.  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Leakage Current                                | Not more than the specified value.  |  |                                   |  |                 |                 |      |      |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Low Temperature Stability Impedance Ratio(MAX) | <table border="1"> <tr> <td>Rated Voltage (Vdc)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> <td>(120Hz)</td> </tr> <tr> <td>Z(-25°C)/Z(20°C)</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td></td> </tr> <tr> <td>Z(-40°C)/Z(20°C)</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td></td> </tr> </table>  | Rated Voltage (Vdc)  | 6.3                               | 10   | 16              | 25              | 35   | 50   | 63            | 100    | (120Hz)       | Z(-25°C)/Z(20°C) | 2    | 2      | 2    | 2       | 2    | 2                  | 2  | 2               |                                    | Z(-40°C)/Z(20°C) | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |  |
| Rated Voltage (Vdc)                            | 6.3   | 10   | 16                                | 25   | 35              | 50              | 63   | 100  | (120Hz)       |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Z(-25°C)/Z(20°C)                               | 2   | 2  | 2                                 | 2  | 2               | 2               | 2    | 2    |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |
| Z(-40°C)/Z(20°C)                               | 3   | 3  | 3                                 | 3  | 3               | 3               | 3    | 3    |               |        |               |                  |      |        |      |         |      |                    |  |                 |                                    |                  |   |   |   |   |   |   |   |   |  |

**◆ MULTIPLIER FOR RIPPLE CURRENT**

| Frequency (Hz) |             | 120  | 1k   | 10k  | 100k≤ |
|----------------|-------------|------|------|------|-------|
| Coefficient    | 5.6~68µF    | 0.40 | 0.70 | 0.90 | 1.00  |
|                | 82~270µF    | 0.50 | 0.73 | 0.92 | 1.00  |
|                | 330~680µF   | 0.55 | 0.77 | 0.94 | 1.00  |
|                | 820~1800µF  | 0.60 | 0.80 | 0.96 | 1.00  |
|                | 2200~6800µF | 0.70 | 0.85 | 0.98 | 1.00  |

**◆ DIMENSIONS**



**◆ PART NUMBER**

□□□    ZL    □□□□□    M    □□□    □□    DXL  
 Rated Voltage    Series    Capacitance    Capacitance Tolerance    Option    Lead Forming    Case Size

**◆ OPTION**

|            |      |
|------------|------|
| PET Sleeve | Code |
|            | EFC  |

**◆STANDARD SIZE**

| Rated Voltage (Vdc) | Capacitance (μF) | Size φD×L(mm) | Rated ripple current (mA r.m.s./105°C, 100kHz) | Impedance (Ω MAX) |               |
|---------------------|------------------|---------------|--|-------------------|---------------|
|                     |                  |               |  | 20°C, 100kHz      | -10°C, 100kHz |
| 6.3                 | 39               | 4×7           | 130  | 0.85              | 2.6           |
|                     | 68               | 5×7           | 210  | 0.43              | 1.3           |
|                     | 150              | 6.3×7         | 300  | 0.23              | 0.69          |
|                     | 150              | 5×11          | 250  | 0.30              | 1.0           |
|                     | 220              | 8×7           | 380  | 0.15              | 0.45          |
|                     | 330              | 6.3×11        | 405  | 0.13              | 0.41          |
|                     | 560              | 8×11.5        | 760  | 0.072             | 0.22          |
|                     | 820              | 8×16          | 995  | 0.056             | 0.17          |
|                     | 1000             | 10×12.5       | 1030   | 0.053             | 0.16          |
|                     | 1200             | 8×20          | 1250   | 0.041             | 0.13          |
|                     | 1200             | 10×16         | 1430   | 0.038             | 0.12          |
|                     | 1500             | 10×20         | 1820   | 0.023             | 0.069         |
|                     | 2200             | 10×23         | 2150   | 0.022             | 0.066         |
|                     | 3300             | 12.5×20       | 2360   | 0.021             | 0.053         |
|                     | 3900             | 12.5×25       | 2770   | 0.018             | 0.045         |
|                     | 4700             | 12.5×30       | 3290   | 0.016             | 0.041         |
| 5600                | 12.5×35          | 3400          | 0.015  | 0.039             |               |
| 5600                | 16×20            | 3140          | 0.018  | 0.045             |               |
| 6800                | 16×25            | 3460          | 0.016  | 0.043             |               |
| 10                  | 27               | 4×7           | 130  | 0.89              | 2.7           |
|                     | 56               | 5×7           | 210  | 0.44              | 1.4           |
|                     | 100              | 5×11          | 250  | 0.30              | 1.0           |
|                     | 120              | 6.3×7         | 300  | 0.23              | 0.69          |
|                     | 180              | 8×7           | 380  | 0.15              | 0.45          |
|                     | 220              | 6.3×11        | 405  | 0.13              | 0.41          |
|                     | 470              | 8×11.5        | 760  | 0.072             | 0.22          |
|                     | 680              | 8×16          | 995  | 0.056             | 0.17          |
|                     | 680              | 10×12.5       | 1030   | 0.053             | 0.16          |
|                     | 1000             | 8×20          | 1250   | 0.041             | 0.13          |
|                     | 1000             | 10×16         | 1430   | 0.038             | 0.12          |
|                     | 1200             | 10×20         | 1820   | 0.023             | 0.069         |
|                     | 1500             | 10×23         | 2150   | 0.022             | 0.066         |
|                     | 2200             | 12.5×20       | 2360   | 0.021             | 0.053         |
|                     | 3300             | 12.5×25       | 2770   | 0.018             | 0.045         |
|                     | 3900             | 12.5×30       | 3290   | 0.016             | 0.041         |
| 3900                | 16×20            | 3140          | 0.018  | 0.045             |               |
| 4700                | 12.5×35          | 3400          | 0.015  | 0.039             |               |
| 5600                | 16×25            | 3460          | 0.016  | 0.043             |               |
| 16                  | 18               | 4×7           | 130  | 0.92              | 2.8           |
|                     | 33               | 5×7           | 210  | 0.45              | 1.4           |
|                     | 56               | 5×11          | 250  | 0.30              | 1.0           |
|                     | 68               | 6.3×7         | 300  | 0.24              | 0.72          |
|                     | 120              | 8×7           | 380  | 0.15              | 0.45          |
|                     | 120              | 6.3×11        | 405  | 0.13              | 0.41          |
|                     | 330              | 8×11.5        | 760  | 0.072             | 0.22          |
|                     | 470              | 8×16          | 995  | 0.056             | 0.17          |
|                     | 470              | 10×12.5       | 1030   | 0.053             | 0.16          |
|                     | 680              | 8×20          | 1250   | 0.041             | 0.13          |
|                     | 680              | 10×16         | 1430   | 0.038             | 0.12          |
|                     | 1000             | 10×20         | 1820   | 0.023             | 0.069         |
|                     | 1200             | 10×23         | 2150   | 0.022             | 0.066         |
|                     | 1500             | 12.5×20       | 2360   | 0.021             | 0.053         |
|                     | 2200             | 12.5×25       | 2770   | 0.018             | 0.045         |
|                     | 2700             | 12.5×30       | 3290   | 0.016             | 0.041         |
| 2700                | 16×20            | 3140          | 0.018  | 0.045             |               |
| 3300                | 12.5×35          | 3400          | 0.015  | 0.039             |               |
| 3900                | 16×25            | 3460          | 0.016  | 0.043             |               |
| 25                  | 15               | 4×7           | 130  | 0.94              | 2.9           |
|                     | 27               | 5×7           | 210  | 0.46              | 1.4           |
|                     | 47               | 5×11          | 250  | 0.30              | 1.0           |
|                     | 56               | 6.3×7         | 300  | 0.24              | 0.72          |
|                     | 100              | 8×7           | 380  | 0.15              | 0.45          |
|                     | 100              | 6.3×11        | 405  | 0.13              | 0.41          |
|                     | 220              | 8×11.5        | 760  | 0.072             | 0.22          |
|                     | 330              | 8×16          | 995  | 0.056             | 0.17          |
|                     | 330              | 10×12.5       | 1030   | 0.053             | 0.16          |
|                     | 470              | 8×20          | 1250   | 0.041             | 0.13          |
|                     | 470              | 10×16         | 1430   | 0.038             | 0.12          |
|                     | 680              | 10×20         | 1820   | 0.023             | 0.069         |
|                     | 820              | 10×23         | 2150   | 0.022             | 0.066         |
|                     | 1000             | 12.5×20       | 2360   | 0.021             | 0.053         |
|                     | 1500             | 12.5×25       | 2770   | 0.018             | 0.045         |
|                     | 1800             | 12.5×30       | 3290   | 0.016             | 0.041         |
| 1800                | 16×20            | 3140          | 0.018  | 0.045             |               |
| 2200                | 12.5×35          | 3400          | 0.015  | 0.039             |               |
| 2700                | 16×25            | 3460          | 0.016  | 0.043             |               |

**◆STANDARD SIZE**

| Rated Voltage (Vdc) | Capacitance (μF) | Size φD×L(mm) | Rated ripple current (mA r.m.s./105°C, 100kHz) | Impedance (Ω MAX) |               |
|---------------------|------------------|---------------|--|-------------------|---------------|
|                     |                  |               |  | 20°C, 100kHz      | -10°C, 100kHz |
| 35                  | 10               | 4×7           | 130  | 0.96              | 2.9           |
|                     | 18               | 5×7           | 210  | 0.47              | 1.5           |
|                     | 33               | 5×11          | 250  | 0.30              | 1.0           |
|                     | 39               | 6.3×7         | 300  | 0.25              | 0.75          |
|                     | 56               | 8×7           | 380  | 0.16              | 0.48          |
|                     | 56               | 6.3×11        | 405  | 0.13              | 0.41          |
|                     | 150              | 8×11.5        | 760  | 0.072             | 0.22          |
|                     | 220              | 8×16          | 995  | 0.056             | 0.17          |
|                     | 220              | 10×12.5       | 1030   | 0.053             | 0.16          |
|                     | 270              | 8×20          | 1250   | 0.041             | 0.13          |
|                     | 330              | 10×16         | 1430   | 0.038             | 0.12          |
|                     | 470              | 10×20         | 1820   | 0.023             | 0.069         |
|                     | 560              | 10×23         | 2150   | 0.022             | 0.066         |
|                     | 680              | 12.5×20       | 2360   | 0.021             | 0.053         |
|                     | 1000             | 12.5×25       | 2770   | 0.018             | 0.045         |
|                     | 1200             | 12.5×30       | 3290   | 0.016             | 0.041         |
| 1200                | 16×20            | 3140          | 0.018  | 0.045             |               |
| 1500                | 12.5×35          | 3400          | 0.015  | 0.039             |               |
| 1800                | 16×25            | 3460          | 0.016  | 0.043             |               |
| 50                  | 5.6              | 4×7           | 130  | 1.0               | 3.0           |
|                     | 10               | 5×7           | 210  | 0.50              | 1.5           |
|                     | 22               | 6.3×7         | 300  | 0.26              | 0.78          |
|                     | 22               | 5×11          | 238  | 0.34              | 1.18          |
|                     | 33               | 8×7           | 380  | 0.17              | 0.51          |
|                     | 56               | 6.3×11        | 385  | 0.14              | 0.50          |
|                     | 100              | 8×11.5        | 724  | 0.074             | 0.22          |
|                     | 120              | 8×16          | 950  | 0.061             | 0.18          |
|                     | 150              | 10×12.5       | 979  | 0.061             | 0.18          |
|                     | 180              | 8×20          | 1190   | 0.046             | 0.14          |
|                     | 220              | 10×16         | 1370   | 0.042             | 0.12          |
|                     | 270              | 10×20         | 1580   | 0.030             | 0.090         |
|                     | 330              | 10×23         | 1870   | 0.028             | 0.085         |
|                     | 470              | 12.5×20       | 2050   | 0.027             | 0.068         |
|                     | 560              | 12.5×25       | 2410   | 0.023             | 0.059         |
|                     | 680              | 12.5×30       | 2860   | 0.021             | 0.052         |
| 820                 | 12.5×35          | 2960          | 0.019  | 0.051             |               |
| 820                 | 16×20            | 2730          | 0.023  | 0.059             |               |
| 1000                | 16×25            | 3010          | 0.021  | 0.056             |               |

| Rated Voltage (Vdc) | Capacitance (μF) | Size φD×L(mm) | Rated ripple current (mA r.m.s./105°C, 100kHz) | Impedance (Ω MAX) |               |
|---------------------|------------------|---------------|--|-------------------|---------------|
|                     |                  |               |  | 20°C, 100kHz      | -10°C, 100kHz |
| 63                  | 15               | 5×11          | 165  | 0.88              | 3.5           |
|                     | 33               | 6.3×11        | 265  | 0.35              | 1.4           |
|                     | 56               | 8×11.5        | 500  | 0.22              | 0.88          |
|                     | 82               | 8×16          | 665  | 0.16              | 0.64          |
|                     | 82               | 10×12.5       | 685  | 0.15              | 0.60          |
|                     | 120              | 8×20          | 820  | 0.12              | 0.48          |
|                     | 120              | 10×16         | 945  | 0.11              | 0.44          |
|                     | 180              | 10×20         | 1100   | 0.080             | 0.32          |
|                     | 180              | 12.5×16       | 1135   | 0.082             | 0.27          |
|                     | 220              | 10×23         | 1300   | 0.073             | 0.29          |
|                     | 270              | 12.5×20       | 1495   | 0.060             | 0.20          |
|                     | 330              | 12.5×25       | 1850   | 0.043             | 0.14          |
|                     | 470              | 12.5×30       | 2250   | 0.039             | 0.13          |
|                     | 470              | 16×20         | 1990   | 0.045             | 0.14          |
|                     | 560              | 12.5×35       | 2450   | 0.033             | 0.11          |
|                     | 560              | 16×25         | 2550   | 0.032             | 0.096         |
|                     | 680              | 12.5×40       | 2780   | 0.029             | 0.096         |
|                     | 680              | 18×20         | 2450   | 0.038             | 0.10          |
|                     | 820              | 16×31.5       | 2810   | 0.026             | 0.078         |
|                     | 820              | 18×25         | 2780   | 0.031             | 0.084         |
| 1000                | 16×35.5          | 2835          | 0.021  | 0.063             |               |
| 1000                | 18×31.5          | 3270          | 0.025  | 0.068             |               |
| 1200                | 16×40            | 3340          | 0.019  | 0.057             |               |
| 1200                | 18×35.5          | 3310          | 0.020  | 0.054             |               |
| 1500                | 18×40            | 3420          | 0.018  | 0.049             |               |
| 100                 | 6.8              | 5×11          | 125  | 1.4               | 5.6           |
|                     | 15               | 6.3×11        | 205  | 0.57              | 2.3           |
|                     | 27               | 8×11.5        | 355  | 0.36              | 1.4           |
|                     | 39               | 8×16          | 450  | 0.25              | 1.0           |
|                     | 47               | 10×12.5       | 450  | 0.24              | 0.96          |
|                     | 56               | 8×20          | 565  | 0.19              | 0.76          |
|                     | 68               | 10×16         | 580  | 0.18              | 0.72          |
|                     | 82               | 10×20         | 750  | 0.13              | 0.52          |
|                     | 82               | 12.5×16       | 735  | 0.13              | 0.43          |
|                     | 100              | 10×23         | 880  | 0.12              | 0.48          |
|                     | 120              | 12.5×20       | 1045   | 0.094             | 0.31          |
|                     | 180              | 12.5×25       | 1195   | 0.071             | 0.23          |
|                     | 220              | 12.5×30       | 1410   | 0.063             | 0.21          |
|                     | 220              | 16×20         | 1295   | 0.071             | 0.21          |
|                     | 270              | 12.5×35       | 1560   | 0.052             | 0.17          |
|                     | 270              | 16×25         | 1600   | 0.053             | 0.16          |
|                     | 270              | 18×20         | 1470   | 0.069             | 0.19          |
|                     | 330              | 12.5×40       | 1700   | 0.046             | 0.15          |
|                     | 390              | 16×31.5       | 1750   | 0.041             | 0.12          |
|                     | 390              | 18×25         | 1620   | 0.049             | 0.13          |
| 470                 | 16×35.5          | 1890          | 0.033  | 0.10              |               |
| 470                 | 18×31.5          | 1775          | 0.039  | 0.11              |               |
| 560                 | 16×40            | 2080          | 0.030  | 0.090             |               |
| 560                 | 18×35.5          | 2060          | 0.031  | 0.084             |               |
| 680                 | 18×40            | 2570          | 0.028  | 0.076             |               |