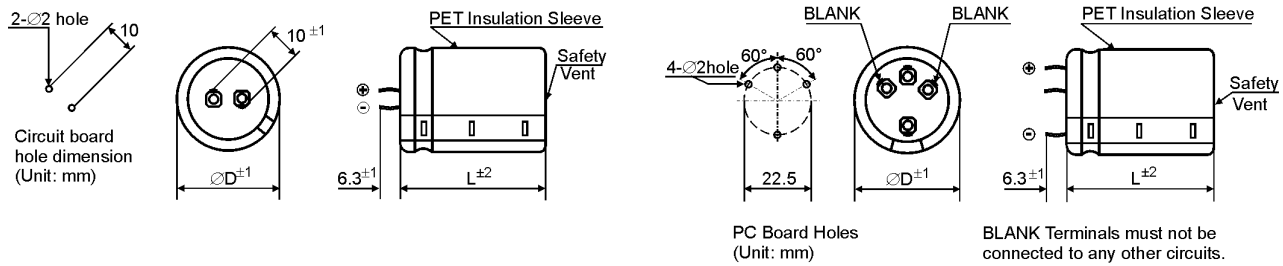


► Specifications /

| Items                   | Characteristics                                                        |
|-------------------------|------------------------------------------------------------------------|
| Temperature range       | -40°C ~ + 105°C (200VDC - 250VDC)<br>-25°C ~ + 105°C (400VDC - 450VDC) |
| Rated voltage           | 200VDC - 450VDC                                                        |
| Surge voltage           | Repetitive max. 30 sec per 6 Minutes                                   |
| Leakage current at 20°C | 0.02 · C · V <sub>r</sub> [μA] or 3 mA, which is smaller.              |
| Capacitance tolerance   | +/- 20%                                                                |
| Useful life             | 6000h at 105°C                                                         |
| Field failure rate      | 0.5 FIT = 0.5 · 10 <sup>-9</sup> Failures/hour                         |
| Failure rate            | Less than 0.1% within the useful life                                  |



► Outline Drawing /



Shape / Form: R (Standard)  
C (with short pin 4 ± 1mm)

Shape / Form: S (D ≥ 35mm)  
X (with short pin 4 ± 1mm)

► Ripple Current Multiplier /

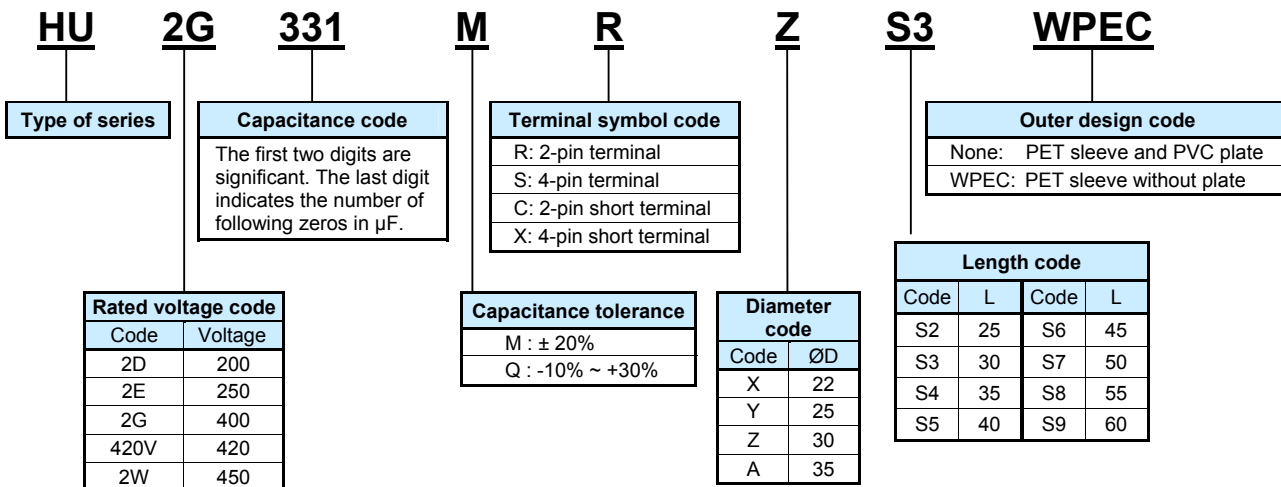
| Frequency [Hz] | 50/60 | 120 | 300 | 1k  | ≥ 10k |
|----------------|-------|-----|-----|-----|-------|
| multiplier     | 0.7   | 1.0 | 1.1 | 1.3 | 1.4   |

| Forced cooling [m/sec] | v < 1.0 | v ≥ 1.0 |
|------------------------|---------|---------|
| multiplier             | 1.0     | 1.1     |

| Temperature [°C] | 40  | 60  | 70  | 85  | 105 |
|------------------|-----|-----|-----|-----|-----|
| multiplier       | 2.3 | 1.9 | 1.7 | 1.4 | 1.0 |

► Product Code /

Example: HU 400V 330μF ±20% 30x30mm Shape „R“



| Rated Voltage Code<br>(Surge Voltage)<br>$V_r$<br>[V DC] | Capacitance<br>$C_r$<br>[ $\mu$ F] | Dissipation factor<br>$\tan \delta$ | Ripple Current              | Ripple Current                        | ESR (typ)<br>at<br>20°C/100Hz<br>[m $\Omega$ ] | DxL<br>[mm]  | Product Code |
|----------------------------------------------------------|------------------------------------|-------------------------------------|-----------------------------|---------------------------------------|------------------------------------------------|--------------|--------------|
|                                                          |                                    |                                     | at<br>40°C/120Hz<br>[A RMS] | at<br>105°C/120Hz<br>$I_r$<br>[A RMS] |                                                |              |              |
| 200<br>2D<br>(250)                                       | 330                                | 0.15                                | 2.71                        | 1.18                                  | 330                                            | 22x25        | HU2D331M□XS2 |
|                                                          | 390                                | 0.15                                | 3.13                        | 1.36                                  | 280                                            | 22x30        | HU2D391M□XS3 |
|                                                          | 470                                | 0.15                                | 3.31                        | 1.44                                  | 240                                            | 25x25        | HU2D471M□YS2 |
|                                                          | 560                                | 0.15                                | 3.84                        | 1.67                                  | 200                                            | 25x30        | HU2D561M□YS3 |
|                                                          |                                    | 0.15                                | 4.00                        | 1.74                                  | 200                                            | 22x35        | HU2D561M□XS4 |
|                                                          | 680                                | 0.15                                | 4.05                        | 1.76                                  | 160                                            | 30x25        | HU2D681M□ZS2 |
|                                                          |                                    | 0.15                                | 4.49                        | 1.95                                  | 160                                            | 25x35        | HU2D681M□YS4 |
|                                                          |                                    | 0.15                                | 4.62                        | 2.01                                  | 160                                            | 22x40        | HU2D681M□XS5 |
|                                                          | 820                                | 0.15                                | 3.84                        | 1.67                                  | 140                                            | 35x25        | HU2D821M□AS2 |
|                                                          |                                    | 0.15                                | 4.72                        | 2.05                                  | 140                                            | 30x30        | HU2D821M□ZS3 |
|                                                          |                                    | 0.15                                | 5.20                        | 2.26                                  | 140                                            | 25x40        | HU2D821M□YS5 |
|                                                          |                                    | 0.15                                | 5.57                        | 2.42                                  | 140                                            | 22x50        | HU2D821M□XS7 |
|                                                          | 1 000                              | 0.15                                | 5.50                        | 2.39                                  | 110                                            | 30x35        | HU2D102M□ZS4 |
|                                                          |                                    | 0.15                                | 6.00                        | 2.61                                  | 110                                            | 25x45        | HU2D102M□YS6 |
|                                                          | 1 200                              | 0.15                                | 4.90                        | 2.13                                  | 100                                            | 35x30        | HU2D122M□AS3 |
|                                                          |                                    | 0.15                                | 6.30                        | 2.74                                  | 100                                            | 30x40        | HU2D122M□ZS5 |
|                                                          |                                    | 0.15                                | 6.83                        | 2.97                                  | 100                                            | 25x50        | HU2D122M□YS7 |
|                                                          | 1 500                              | 0.15                                | 5.80                        | 2.52                                  | 80                                             | 35x35        | HU2D152M□AS4 |
|                                                          |                                    | 0.15                                | 7.36                        | 3.20                                  | 80                                             | 30x45        | HU2D152M□ZS6 |
|                                                          | 1 800                              | 0.15                                | 6.62                        | 2.88                                  | 70                                             | 35x40        | HU2D182M□AS5 |
| 0.15                                                     |                                    | 8.40                                | 3.65                        | 70                                    | 30x50                                          | HU2D182M□ZS7 |              |
| 2 200                                                    | 0.15                               | 7.64                                | 3.32                        | 50                                    | 35x45                                          | HU2D222M□AS6 |              |
| 250<br>2E<br>(300)                                       | 220                                | 0.15                                | 2.39                        | 1.04                                  | 440                                            | 22x25        | HU2E221M□XS2 |
|                                                          | 330                                | 0.15                                | 3.01                        | 1.31                                  | 290                                            | 25x25        | HU2E331M□YS2 |
|                                                          |                                    | 0.15                                | 3.13                        | 1.36                                  | 290                                            | 22x30        | HU2E331M□XS3 |
|                                                          |                                    | 0.15                                | 3.27                        | 1.42                                  | 290                                            | 20x35        | HU2E331M□WS4 |
|                                                          | 390                                | 0.15                                | 3.47                        | 1.51                                  | 250                                            | 25x30        | HU2E391M□YS3 |
|                                                          |                                    | 0.15                                | 3.59                        | 1.56                                  | 250                                            | 22x35        | HU2E391M□XS4 |
|                                                          | 470                                | 0.15                                | 3.59                        | 1.56                                  | 210                                            | 30x25        | HU2E471M□ZS2 |
|                                                          |                                    | 0.15                                | 4.19                        | 1.82                                  | 210                                            | 22x40        | HU2E471M□XS5 |
|                                                          | 560                                | 0.15                                | 4.39                        | 1.91                                  | 180                                            | 25x35        | HU2E561M□YS4 |
|                                                          |                                    | 0.15                                | 4.76                        | 2.07                                  | 180                                            | 22x45        | HU2E561M□XS6 |
|                                                          | 680                                | 0.15                                | 3.84                        | 1.67                                  | 150                                            | 35x25        | HU2E681M□AS2 |
|                                                          |                                    | 0.15                                | 4.60                        | 2.00                                  | 150                                            | 30x30        | HU2E681M□ZS3 |
|                                                          |                                    | 0.15                                | 5.34                        | 2.32                                  | 150                                            | 25x45        | HU2E681M□YS6 |
|                                                          | 820                                | 0.15                                | 4.46                        | 1.94                                  | 120                                            | 35x30        | HU2E821M□AS3 |
|                                                          |                                    | 0.15                                | 5.31                        | 2.31                                  | 120                                            | 30x35        | HU2E821M□ZS4 |
|                                                          |                                    | 0.15                                | 6.10                        | 2.65                                  | 120                                            | 25x50        | HU2E821M□YS7 |
|                                                          | 1 000                              | 0.15                                | 5.15                        | 2.24                                  | 100                                            | 35x35        | HU2E102M□AS4 |
|                                                          |                                    | 0.15                                | 6.14                        | 2.67                                  | 100                                            | 30x40        | HU2E102M□ZS5 |
|                                                          | 1 200                              | 0.15                                | 5.91                        | 2.57                                  | 80                                             | 35x40        | HU2E122M□AS5 |
|                                                          |                                    | 0.15                                | 7.31                        | 3.18                                  | 80                                             | 30x50        | HU2E122M□ZS7 |
| 1 500                                                    | 0.15                               | 6.90                                | 3.00                        | 70                                    | 35x45                                          | HU2E152M□AS6 |              |
| 1 800                                                    | 0.15                               | 7.87                                | 3.42                        | 60                                    | 35x50                                          | HU2E182M□AS7 |              |
| 400<br>2G<br>(450)                                       | 120                                | 0.20                                | 1.96                        | 0.85                                  | 800                                            | 22x25        | HU2G121M□XS2 |
|                                                          | 150                                | 0.20                                | 2.30                        | 1.00                                  | 640                                            | 22x30        | HU2G151M□XS3 |
|                                                          | 180                                | 0.20                                | 2.65                        | 1.15                                  | 540                                            | 22x35        | HU2G181M□XS4 |
|                                                          | 220                                | 0.20                                | 2.92                        | 1.27                                  | 440                                            | 25x30        | HU2G221M□YS3 |
|                                                          |                                    | 0.20                                | 3.06                        | 1.33                                  | 440                                            | 22x40        | HU2G221M□XS5 |
|                                                          | 270                                | 0.20                                | 3.38                        | 1.47                                  | 360                                            | 25x35        | HU2G271M□YS4 |
|                                                          |                                    | 0.20                                | 3.52                        | 1.53                                  | 360                                            | 22x45        | HU2G271M□XS6 |
|                                                          | 330                                | 0.20                                | 3.70                        | 1.61                                  | 290                                            | 35x25        | HU2G331M□AS2 |
|                                                          |                                    | 0.20                                | 3.77                        | 1.64                                  | 290                                            | 30x30        | HU2G331M□ZS3 |
|                                                          |                                    | 0.20                                | 3.89                        | 1.69                                  | 290                                            | 25x40        | HU2G331M□YS5 |
| 0.20                                                     |                                    | 4.03                                | 1.75                        | 290                                   | 22x50                                          | HU2G331M□XS7 |              |

| Rated Voltage Code<br>(Surge Voltage)<br>$V_r$<br>[V DC] | Capacitance<br>$C_r$<br>[ $\mu$ F] | Dissipation factor | Ripple Current at 40°C/120Hz | Ripple Current at 105°C/120Hz | ESR (typ) at 20°C/100Hz | DxL   | Product Code   |                |
|----------------------------------------------------------|------------------------------------|--------------------|------------------------------|-------------------------------|-------------------------|-------|----------------|----------------|
|                                                          |                                    | $\tan \delta$      | [A RMS]                      | [A RMS]                       | [m $\Omega$ ]           | [mm]  |                |                |
| 400<br>2G<br>(450)                                       | 390                                | 0.20               | 4.28                         | 1.86                          | 250                     | 30x35 | HU2G391M□ZS4   |                |
|                                                          |                                    | 0.20               | 4.39                         | 1.91                          | 250                     | 25x45 | HU2G391M□YS6   |                |
|                                                          | 470                                | 0.20               | 4.62                         | 2.01                          | 210                     | 35x30 | HU2G471M□AS3   |                |
|                                                          |                                    | 0.20               | 4.88                         | 2.12                          | 210                     | 30x40 | HU2G471M□ZS5   |                |
|                                                          | 560                                | 0.20               | 5.29                         | 2.30                          | 180                     | 35x35 | HU2G561M□AS4   |                |
|                                                          |                                    | 0.20               | 5.52                         | 2.40                          | 180                     | 30x45 | HU2G561M□ZS6   |                |
|                                                          | 680                                | 0.20               | 6.05                         | 2.63                          | 150                     | 35x40 | HU2G681M□AS5   |                |
|                                                          |                                    | 0.20               | 6.28                         | 2.73                          | 150                     | 30x50 | HU2G681M□ZS7   |                |
|                                                          | 820                                | 0.20               | 6.85                         | 2.98                          | 120                     | 35x45 | HU2G821M□AS6   |                |
|                                                          |                                    | 0.20               | 8.19                         | 3.56                          | 100                     | 35x60 | HU2G102M□AS9   |                |
|                                                          | 420<br>420V<br>(470)               | 100                | 0.20                         | 1.77                          | 0.77                    | 1020  | 22x25          | HU420V101M□XS2 |
|                                                          |                                    |                    | 0.20                         | 2.28                          | 0.99                    | 680   | 25x25          | HU420V151M□YS2 |
|                                                          |                                    | 150                | 0.20                         | 2.30                          | 1.00                    | 680   | 22x30          | HU420V151M□XS3 |
|                                                          |                                    |                    | 0.20                         | 2.62                          | 1.14                    | 570   | 25x30          | HU420V181M□YS3 |
| 180                                                      |                                    | 0.20               | 2.67                         | 1.16                          | 570                     | 22x35 | HU420V181M□XS4 |                |
|                                                          |                                    | 0.20               | 2.90                         | 1.26                          | 470                     | 30x25 | HU420V221M□ZS2 |                |
| 220                                                      |                                    | 0.20               | 3.06                         | 1.33                          | 470                     | 22x40 | HU420V221M□XS5 |                |
|                                                          |                                    | 0.20               | 3.06                         | 1.33                          | 470                     | 25x35 | HU420V221M□YS4 |                |
|                                                          |                                    | 0.20               | 3.34                         | 1.45                          | 380                     | 35x25 | HU420V271M□AS2 |                |
| 270                                                      |                                    | 0.20               | 3.38                         | 1.47                          | 380                     | 30x30 | HU420V271M□ZS3 |                |
|                                                          |                                    | 0.20               | 3.52                         | 1.53                          | 380                     | 25x40 | HU420V271M□YS5 |                |
|                                                          |                                    | 0.20               | 3.63                         | 1.58                          | 380                     | 22x50 | HU420V271M□XS7 |                |
| 330                                                      |                                    | 0.20               | 3.96                         | 1.72                          | 310                     | 30x35 | HU420V331M□ZS4 |                |
|                                                          |                                    | 0.20               | 4.05                         | 1.76                          | 310                     | 25x45 | HU420V331M□YS6 |                |
| 390                                                      |                                    | 0.20               | 4.23                         | 1.84                          | 270                     | 35x30 | HU420V391M□AS3 |                |
|                                                          |                                    | 0.20               | 4.46                         | 1.94                          | 270                     | 30x40 | HU420V391M□ZS5 |                |
|                                                          |                                    | 0.20               | 4.53                         | 1.97                          | 270                     | 25x50 | HU420V391M□YS7 |                |
| 470                                                      |                                    | 0.20               | 4.83                         | 2.10                          | 220                     | 35x35 | HU420V471M□AS4 |                |
|                                                          |                                    | 0.20               | 5.06                         | 2.20                          | 220                     | 30x45 | HU420V471M□ZS6 |                |
| 560                                                      |                                    | 0.20               | 5.50                         | 2.39                          | 190                     | 35x40 | HU420V561M□AS5 |                |
|                                                          |                                    | 0.20               | 5.68                         | 2.47                          | 190                     | 30x50 | HU420V561M□ZS7 |                |
| 680                                                      |                                    | 0.20               | 6.26                         | 2.72                          | 150                     | 35x45 | HU420V681M□AS6 |                |
|                                                          |                                    | 0.20               | 7.06                         | 3.07                          | 130                     | 35x50 | HU420V821M□AS7 |                |
| 450<br>2W<br>(500)                                       |                                    | 100                | 0.20                         | 1.77                          | 0.77                    | 1020  | 22x25          | HU2W101M□XS2   |
|                                                          |                                    |                    | 0.20                         | 1.91                          | 0.83                    | 1020  | 22x30          | HU2W101M□XS3   |
|                                                          |                                    | 120                | 0.20                         | 2.05                          | 0.89                    | 850   | 25x25          | HU2W121M□YS2   |
|                                                          |                                    |                    | 0.20                         | 2.07                          | 0.90                    | 850   | 22x30          | HU2W121M□XS3   |
|                                                          |                                    | 150                | 0.20                         | 2.44                          | 1.06                    | 680   | 22x35          | HU2W151M□XS4   |
|                                                          | 0.20                               |                    | 2.62                         | 1.14                          | 570                     | 25x30 | HU2W181M□YS3   |                |
|                                                          | 180                                | 0.20               | 2.62                         | 1.14                          | 570                     | 30x25 | HU2W181M□ZS2   |                |
|                                                          |                                    | 0.20               | 2.76                         | 1.20                          | 570                     | 25x35 | HU2W181M□YS4   |                |
|                                                          |                                    | 0.20               | 2.76                         | 1.20                          | 570                     | 22x40 | HU2W181M□XS5   |                |
|                                                          | 220                                | 0.20               | 3.06                         | 1.33                          | 470                     | 25x35 | HU2W221M□YS4   |                |
|                                                          |                                    | 0.20               | 3.17                         | 1.38                          | 470                     | 22x45 | HU2W221M□XS6   |                |
|                                                          | 270                                | 0.20               | 3.34                         | 1.45                          | 380                     | 35x25 | HU2W271M□AS2   |                |
|                                                          |                                    | 0.20               | 3.38                         | 1.47                          | 380                     | 30x30 | HU2W271M□ZS3   |                |
|                                                          |                                    | 0.20               | 3.52                         | 1.53                          | 380                     | 25x40 | HU2W271M□YS5   |                |
|                                                          | 330                                | 0.20               | 3.86                         | 1.68                          | 310                     | 35x30 | HU2W331M□AS3   |                |
|                                                          |                                    | 0.20               | 3.96                         | 1.72                          | 310                     | 30x35 | HU2W331M□ZS4   |                |
|                                                          |                                    | 0.20               | 4.19                         | 1.82                          | 310                     | 25x50 | HU2W331M□YS7   |                |
|                                                          | 390                                | 0.20               | 4.46                         | 1.94                          | 270                     | 30x40 | HU2W391M□ZS5   |                |
|                                                          |                                    | 0.20               | 4.83                         | 2.10                          | 220                     | 35x35 | HU2W471M□AS4   |                |
|                                                          | 470                                | 0.20               | 5.06                         | 2.20                          | 220                     | 30x45 | HU2W471M□ZS6   |                |
|                                                          |                                    | 0.20               | 5.22                         | 2.27                          | 220                     | 30x50 | HU2W471M□ZS7   |                |
|                                                          |                                    | 0.20               | 5.50                         | 2.39                          | 190                     | 35x40 | HU2W561M□AS5   |                |
|                                                          | 680                                | 0.20               | 6.42                         | 2.79                          | 150                     | 35x50 | HU2W681M□AS7   |                |

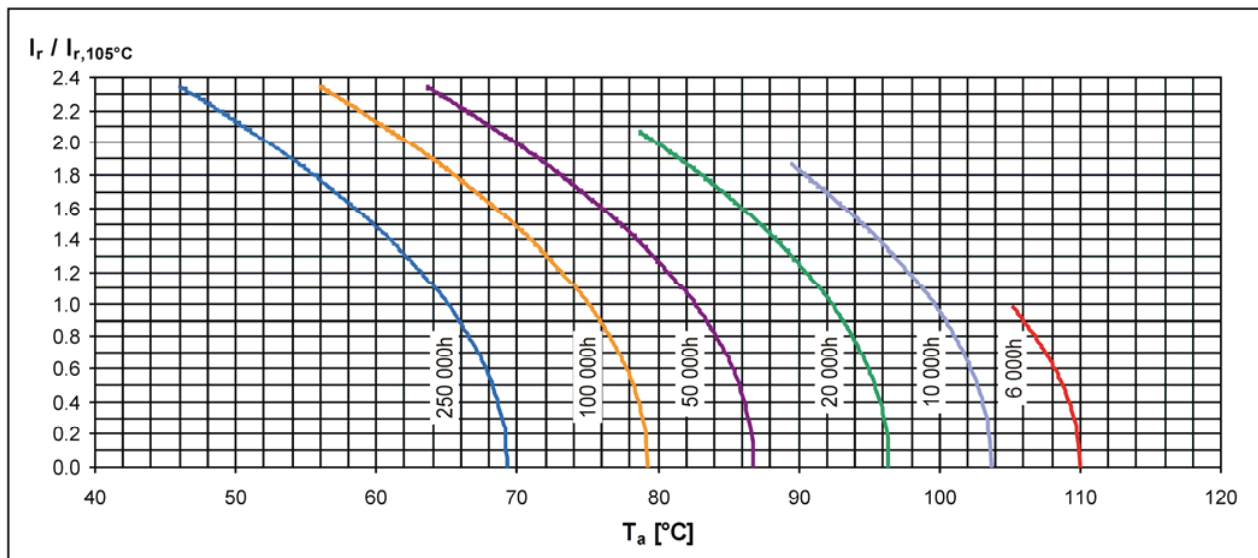
► **Life Time Table /**

| HU                        | Useful life as function of ambient temperature and ripple current |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---------------------------|-------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                           | $I_r$ at 105°C                                                    | x 1.0 | x 1.1 | x 1.2 | x 1.3 | x 1.4 | x 1.5 | x 1.6 | x 1.7 | x 1.8 | x 1.9 | x 2.0 | x 2.1 | x 2.2 | x 2.3 |
| $T_a = 40^\circ\text{C}$  | 250                                                               | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   |
| $T_a = 45^\circ\text{C}$  | 250                                                               | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   |       |       |
| $T_a = 50^\circ\text{C}$  | 250                                                               | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   |       |       |       |
| $T_a = 55^\circ\text{C}$  | 250                                                               | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 228   | 196   |       |       |       |
| $T_a = 60^\circ\text{C}$  | 250                                                               | 250   | 250   | 250   | 250   | 245   | 217   | 191   | 167   | 144   |       |       |       |       |       |
| $T_a = 65^\circ\text{C}$  | 250                                                               | 232   | 212   | 192   | 173   | 155   | 137   | 121   | 105   |       |       |       |       |       |       |
| $T_a = 70^\circ\text{C}$  | 159                                                               | 147   | 134   | 122   | 110   | 98    | 87    | 76    |       |       |       |       |       |       |       |
| $T_a = 75^\circ\text{C}$  | 101                                                               | 93    | 85    | 77    | 69    | 62    | 55    |       |       |       |       |       |       |       |       |
| $T_a = 80^\circ\text{C}$  | 65                                                                | 59    | 54    | 49    | 44    |       |       |       |       |       |       |       |       |       |       |
| $T_a = 85^\circ\text{C}$  | 40                                                                | 37    | 34    | 31    | 28    |       |       |       |       |       |       |       |       |       |       |
| $T_a = 90^\circ\text{C}$  | 25                                                                | 23    | 21    |       |       |       |       |       |       |       |       |       |       |       |       |
| $T_a = 95^\circ\text{C}$  | 16                                                                | 15    |       |       |       |       |       |       |       |       |       |       |       |       |       |
| $T_a = 100^\circ\text{C}$ | 10                                                                | 9     |       |       |       |       |       |       |       |       |       |       |       |       |       |
| $T_a = 105^\circ\text{C}$ | 6                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

khrs                      Max. value limited to 250 000 hours.

► **Life Time Graph /**

Useful life depending on ambient temperature  $T_a$  and ripple current operating conditions  $I_r$  versus rated ripple current at the upper category temperature  $I_{r,105^\circ\text{C},120\text{Hz}}$



► **Life Time Tests and Requirements /**

| Life time test | Reference                                 | Test procedure                                               | Life time criteria                                                                                 |
|----------------|-------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Endurance test | JIS-C-5101-4<br>JIS-C-5102<br>IEC 60384-4 | $T_a = 105^\circ\text{C}$ ; $V_r, I_r$ applied<br>4000 hours | $\Delta C/C < 20\%$<br>$\text{Tan}\delta < 200\%$ (of initial value)<br>$I_L = \text{spec. value}$ |
| Useful life    | JIS-C-5104-4<br>IEC 60384-4               | $T_a = 105^\circ\text{C}$ ; $V_r, I_r$ applied<br>6000 hours | $\Delta C/C < 20\%$<br>$\text{Tan}\delta < 200\%$ (of initial value)<br>$I_L = \text{spec. value}$ |