

# VFL · Screw-Terminal · 12000 h/85 °C

Long Life · Bottom cooling design · Smaller Size

Optional design for permanent and deep charge-discharge application with high voltage hub and pulsed operation mode upon request.

Spezielles Design für häufige und tiefe Lade-, Entladeanwendungen mit hohem Spannungshub und Impulsbetrieb auf Anfrage erhältlich.

## > Specifications · Spezifikationen

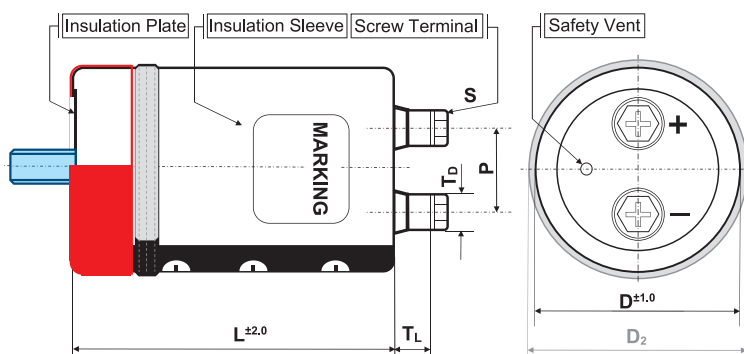
| Items   | Characteristics   |
|---|---|
| Temperature range                                 | -40°C ~ +85°C   |
| Capacitance tolerance (at 20°C)                   | Standard +/- 20%, -10/+30% on request                     |
| Surge voltage / Ripple voltage                    | Repetitive max. 30 sec per 6 Minutes / ≤ 50V              |
| Leakage current max. I <sub>l</sub> (20°C, 5 min) | 0.01 · C · V <sub>r</sub> [μA] or 5 mA, which is smaller. |
| Useful life                                       | 12 000 hours at 85°C                                      |
| Field failure rate                                | 0.5 FIT = 0.5 · 10 <sup>-9</sup> Failures/hour            |
| RoHS conform                                      | Directive 2011/65/EU & (EU)2015/863                       |
| Specification / Vibration                         | JIS C 5101-4/0.75mm, 10...55Hz, 10g, 3x2h                 |
| Outer materials                                   | UL94-V0/UL224-VW1 certified (cap/sleeve)                  |
| Sleeve withstanding voltage                       | 4000 Vac / 1min between terminals bundled and plate*      |

\* Typical value



## > Shape designation · Formbezeichnung

- for details refer to p. 8–9 · technische Details siehe S. 8–9
- for mounting options refer to p. 149 ff · Montageoptionen siehe S. 149 ff



|                         | B | I/Y | N | N+WC |
|-------------------------|---|-----|---|------|
| outer sleeve            | • | •   | • | •    |
| insulation plate        | • | •   | • |      |
| stud bolt               | • |     |   |      |
| bottom double sleeve    |   | •   |   |      |
| integrated seating ring |   |     |   | •    |

| ØD | available shape | P    | S     | T <sub>L</sub> | T <sub>D</sub> | Cap material |
|----|-----------------|------|-------|----------------|----------------|--------------|
| 64 | B, N, I, Y      | 28.6 | M5x10 | 8.0            | 11             | PH           |
| 77 | B, N, I, Y, WC  | 31.5 | M5x10 | 8.0            | 11             | PH           |
|    |                 |      | M6x12 | 9.0            | 12             | PH           |
| 90 | B, N, I, Y, WC  | 31.5 | M5x10 | 7.0            | 11             | PH           |
|    |                 |      | M6x12 | 8.0            | 12             | PH           |

Size in mm. First listed terminal is standard.

## > Product Code · Bestellbezeichnung

**Example:** Series VFL · 12000 μF +/- 20 % · 400 V · D=90 mm · L= 150 mm with Y-Bracket

| VFL            | 2G  | 123 | Y  | F                       | 150                             |
|----------------|---|-----|--|-------------------------|---------------------------------|
| Type of series | Capacitance code  |     | Fixing symbol code                         | Case code diameter      | Specific features (e.g. M6 ...) |
|                | The first two digits are significant. The last digit indicates the number of following zeros in μF. |     | B : Bolt                                   | ØD                      |                                 |
|                | Rated voltage code  |     | N : single outer sleeve                    | Code                    |                                 |
|                |   |     | I : 2 Stoppers Bracket                     | 64                      | D                               |
|                |   |     | Y : 3 Stoppers Bracket                     | 77                      | E                               |
|                |   |     | N + suffix WC: blank bottom + seating ring | 90                      | F                               |
|                |   |     | Capacitance tolerance                      | Case Code length        |                                 |
|                |   |     | Ø : ± 20 %                                 | Length in mm (3 digits) |                                 |
|                |   |     | Q : -10 % ~ + 30 %                         |                         |                                 |

# VFL · Screw-Terminal · 12000 h/85 °C

| Rated VoltageCode<br>(Surge Voltage)<br>$V_r$<br>[V DC]    | Capacitance<br>$C_r$<br>[ $\mu$ F] | Ripple Current<br>at<br>85°C/120Hz<br>$I_r$<br>[A RMS] | Ripple Current<br>at<br>40°C/120Hz<br>[A RMS] | ESR (typ)<br>at<br>20°C/100Hz<br>[m $\Omega$ ] | Zmax<br>at<br>20°C/10kHz<br>[m $\Omega$ ] | ESL<br>(typ)<br>[nH] | Dissipation<br>Factor<br>at<br>20°C/120Hz<br>Tan $\delta$ | DxL<br>[mm]   | Product Code<br><br># = variable value,<br>see fixing code<br>in the product code |
|--|------------------------------------|--|---|--|---|----------------------|---|---------------|---|
| <b>350 VDC</b><br>Code: 2V<br><br>Surge Voltage<br>400 VDC | 4 700                              | 15.1   | 31.7  | 21   | 22  | 18                   | 0.20  | 64x94         | VFL2V472#D094   |
|  | 5 600                              | 16.9   | 35.5  | 18   | 19  | 18                   | 0.20  | 64x107        | VFL2V562#D107   |
|  | 6 800                              | 18.7   | 39.3  | 15   | 15  | 18                   | 0.20  | 64x123        | VFL2V682#D123   |
|  |                                    | 20.9   | 43.9  | 15   | 15  | 20                   | 0.20  | 77x95         | VFL2V682#E095   |
|  | 8 200                              | 20.2   | 42.4  | 12   | 15  | 18                   | 0.20  | 64x147        | VFL2V822#D147   |
|  |                                    | 22.9   | 48.1  | 12   | 15  | 20                   | 0.20  | 77x108        | VFL2V822#E108   |
|  | 10 000                             | 22.9   | 48.1  | 10   | 15  | 18                   | 0.20  | 64x187        | VFL2V103#D187   |
|  |                                    | 25.9   | 54.4  | 10   | 15  | 20                   | 0.20  | 77x124        | VFL2V103#E124   |
|  |                                    | 29.3   | 61.5  | 10   | 15  | 20                   | 0.20  | 90x97         | VFL2V103#F097   |
|  | 12 000                             | 27.8   | 58.4  | 8  | 13  | 20                   | 0.20  | 77x148        | VFL2V123#E148   |
|  |                                    | 31.7   | 66.6  | 8  | 13  | 20                   | 0.20  | 90x126        | VFL2V123#F126   |
|  | 15 000                             | 31.9   | 67.0  | 7  | 10  | 20                   | 0.20  | 77x188        | VFL2V153#E188   |
|  |                                    | 35.2   | 73.9  | 7  | 10  | 20                   | 0.20  | 90x150        | VFL2V153#F150   |
|  | 18 000                             | 36.0   | 75.6  | 7  | 10  | 20                   | 0.20  | 77x228        | VFL2V183#E228   |
| 37.9   |                                    | 79.6   | 7   | 10   | 20  | 0.20                 | 90x167  | VFL2V183#F167 |   |
| 22 000   | 41.1                               | 86.3   | 6   | 9  | 20  | 0.20                 | 90x230  | VFL2V223#F230 |   |
| <b>400 VDC</b><br>Code: 2G<br><br>Surge Voltage<br>450 VDC | 3 300                              | 12.7   | 26.7  | 30   | 31  | 18                   | 0.20  | 64x94         | VFL2G332#D094   |
|  | 3 900                              | 13.8   | 29.0  | 26   | 28  | 18                   | 0.20  | 64x94         | VFL2G392#D094   |
|  | 4 700                              | 15.5   | 32.6  | 21   | 22  | 18                   | 0.20  | 64x107        | VFL2G472#D107   |
|  | 5 600                              | 16.9   | 35.5  | 18   | 19  | 18                   | 0.20  | 64x123        | VFL2G562#D123   |
|  |                                    | 19.0   | 39.9  | 18   | 19  | 20                   | 0.20  | 77x95         | VFL2G562#E095   |
|  | 6 800                              | 18.4   | 38.6  | 15   | 15  | 18                   | 0.20  | 64x147        | VFL2G682#D147   |
|  |                                    | 20.8   | 43.7  | 15   | 15  | 20                   | 0.20  | 77x108        | VFL2G682#E108   |
|  | 8 200                              | 20.8   | 43.7  | 12   | 15  | 18                   | 0.20  | 64x187        | VFL2G822#D187   |
|  |                                    | 23.5   | 49.4  | 12   | 15  | 20                   | 0.20  | 77x124        | VFL2G822#E124   |
|  |                                    | 26.6   | 55.9  | 12   | 15  | 20                   | 0.20  | 90x97         | VFL2G822#F097   |
|  | 10 000                             | 25.4   | 53.3  | 10   | 15  | 20                   | 0.20  | 77x148        | VFL2G103#E148   |
|  |                                    | 28.9   | 60.7  | 10   | 15  | 20                   | 0.20  | 90x126        | VFL2G103#F126   |
|  | 12 000                             | 28.5   | 59.9  | 8  | 13  | 20                   | 0.20  | 77x188        | VFL2G123#E188   |
|  |                                    | 31.3   | 65.7  | 8  | 13  | 20                   | 0.20  | 90x143        | VFL2G123#F143   |
|  |                                    | 31.5   | 66.2  | 8  | 13  | 20                   | 0.20  | 90x150        | VFL2G123#F150   |
|  | 15 000                             | 32.9   | 69.1  | 8  | 10  | 20                   | 0.20  | 77x228        | VFL2G153#E228   |
| 34.6   |                                    | 72.7   | 8   | 10   | 20  | 0.20                 | 90x167  | VFL2G153#F167 |   |
| 18 000   | 37.2                               | 78.1   | 6   | 9  | 20  | 0.20                 | 90x230  | VFL2G183#F230 |   |
| <b>450 VDC</b><br>Code: 2W<br><br>Surge Voltage<br>500 VDC | 2 700                              | 11.7   | 24.6  | 38   | 40  | 18                   | 0.20  | 64x94         | VFL2W272#D094   |
|  | 3 300                              | 13.3   | 27.9  | 30   | 35  | 18                   | 0.20  | 64x107        | VFL2W332#D107   |
|  |                                    | 14.9   | 31.3  | 30   | 33  | 18                   | 0.20  | 77x95         | VFL2W332#E095   |
|  | 3 900                              | 14.5   | 30.5  | 27   | 32  | 18                   | 0.20  | 64x123        | VFL2W392#D123   |
|  |                                    | 16.2   | 34.0  | 27   | 32  | 20                   | 0.20  | 77x95         | VFL2W392#E095   |
|  | 4 700                              | 15.6   | 32.8  | 21   | 21  | 18                   | 0.20  | 64x147        | VFL2W472#D147   |
| 17.8   |                                    | 37.4   | 21  | 21   | 20  | 0.20                 | 77x108  | VFL2W472#E108 |   |

Additional designs on request · Weitere Designs auf Anfrage

| Rated VoltageCode<br>(Surge Voltage)<br>$V_r$<br>[V DC]    | Capacitance<br>$C_r$<br>[ $\mu$ F]                         | Ripple Current<br>at<br>85°C/120Hz<br>$I_r$<br>[A RMS] | Ripple Current<br>at<br>40°C/120Hz<br>[A RMS] | ESR (typ)<br>at<br>20°C/100Hz<br>[m $\Omega$ ] | Zmax<br>at<br>20°C/10kHz<br>[m $\Omega$ ] | ESL<br>(typ)<br>[nH] | Dissipation<br>Factor<br>at<br>20°C/120Hz<br>Tan $\delta$ | DxL<br>[mm]   | Product Code<br><br># = variable value,<br>see fixing code<br>in the product code |
|--|--|--|---|--|---|----------------------|---|---------------|---|
| <b>450 VDC</b><br>Code: 2W<br><br>Surge Voltage<br>500 VDC | 5 600  | 17.5   | 36.8  | 20   | 20  | 18                   | 0.20  | 64x164        | VFL2W562#D164   |
|  |  | 19.9   | 41.8  | 20   | 20  | 20                   | 0.20  | 77x124        | VFL2W562#E124   |
|  |  | 22.5   | 47.3  | 20   | 20  | 20                   | 0.20  | 90x97         | VFL2W562#F097   |
|  | 6 300  | 21.2   | 44.3  | 18   | 19  | 20                   | 0.20  | 77x139        | VFL2W632#E139   |
|  |  | 19.4   | 40.7  | 15   | 18  | 18                   | 0.20  | 64x187        | VFL2W682#D187   |
|  | 6 800  | 21.4   | 44.9  | 15   | 18  | 20                   | 0.20  | 77x148        | VFL2W682#E148   |
|  |  | 24.6   | 51.7  | 15   | 18  | 20                   | 0.20  | 90x110        | VFL2W682#F110   |
|  |  | 24.0   | 50.4  | 14   | 16  | 20                   | 0.20  | 77x165        | VFL2W822#E165   |
|  | 8 200  | 26.8   | 56.3  | 14   | 16  | 20                   | 0.20  | 90x126        | VFL2W822#F126   |
|  |  | 26.7   | 56.1  | 10   | 15  | 20                   | 0.20  | 77x188        | VFL2W103#E188   |
|  | 10 000   | 29.4   | 61.7  | 10   | 15  | 20                   | 0.20  | 90x150        | VFL2W103#F150   |
|  |  | 30.2   | 63.4  | 9  | 12  | 20                   | 0.20  | 77x228        | VFL2W123#E228   |
|  | 12 000   | 31.7   | 67.0  | 9  | 12  | 20                   | 0.20  | 90x167        | VFL2W123#F167   |
|  |  | 34.8   | 73.1  | 7  | 10  | 20                   | 0.20  | 90x230        | VFL2W153#F230   |
|  | 17 000   | 37.0   | 77.7  | 6  | 8   | 20                   | 0.20  | 90x230        | VFL2W173#F230   |
|  | <b>500 VDC</b><br>Code: 2H<br><br>Surge Voltage<br>550 VDC | 1 800  | 9.1   | 19.1   | 53  | 50                   | 18  | 0.20          | 64x94   |
| 2 200  |  | 10.3   | 21.6  | 40   | 35  | 18                   | 0.20  | 64x107        | VFL2H222#D107   |
| 2 700  |  | 11.5   | 24.2  | 37   | 33  | 18                   | 0.20  | 64x123        | VFL2H272#D123   |
|  |  | 12.9   | 27.1  | 37   | 33  | 20                   | 0.20  | 77x95         | VFL2H272#E095   |
| 3 300  |  | 12.5   | 26.3  | 36   | 32  | 18                   | 0.20  | 64x147        | VFL2H332#D147   |
|  |  | 14.2   | 29.8  | 36   | 32  | 20                   | 0.20  | 77x108        | VFL2H332#E108   |
| 3 900  |  | 13.9   | 29.2  | 27   | 29  | 18                   | 0.20  | 64x164        | VFL2H392#D164   |
|  |  | 15.8   | 33.2  | 27   | 29  | 20                   | 0.20  | 77x124        | VFL2H392#E124   |
|  |  | 17.9   | 37.6  | 27   | 29  | 20                   | 0.20  | 90x97         | VFL2H392#F097   |
| 4 700  |  | 15.4   | 32.3  | 25   | 25  | 20                   | 0.20  | 64x187        | VFL2H472#D187   |
|  |  | 17.0   | 35.7  | 25   | 25  | 20                   | 0.20  | 77x148        | VFL2H472#E148   |
|  |  | 19.5   | 41.0  | 25   | 25  | 20                   | 0.20  | 90x110        | VFL2H472#F110   |
| 5 600  |  | 18.9   | 39.7  | 23   | 21  | 20                   | 0.20  | 77x165        | VFL2H562#E165   |
|  |  | 21.1   | 44.3  | 23   | 21  | 20                   | 0.20  | 90x126        | VFL2H562#F126   |
| 6 800  |  | 20.9   | 43.9  | 20   | 18  | 20                   | 0.20  | 77x188        | VFL2H682#E188   |
|  |  | 23.1   | 48.5  | 20   | 18  | 20                   | 0.20  | 90x150        | VFL2H682#F150   |
| 8 200  | 25.0   | 52.5   | 17  | 16   | 20  | 0.20                 | 90x167  | VFL2H822#F167 |   |
| 10 000   | 27.8   | 58.4   | 14  | 12   | 20  | 0.20                 | 90x190  | VFL2H103#F190 |   |
| 12 000   | 29.6   | 62.2   | 12  | 10   | 20  | 0.20                 | 90x230  | VFL2H123#F230 |   |
| <b>550 VDC</b><br>Code: 2L<br><br>Surge Voltage<br>600 VDC | 1 200  | 7.3  | 15.3  | 93   | 100                                       | 18                   | 0.20  | 64x94         | VFL2L122#D094   |
|  | 1 500  | 8.3  | 17.4  | 74   | 80  | 18                   | 0.20  | 64x107        | VFL2L152#D107   |
|  | 1 800  | 9.1  | 19.1  | 61   | 60  | 18                   | 0.20  | 64x123        | VFL2L182#D123   |
|  |  | 10.3   | 21.6  | 61   | 60  | 20                   | 0.20  | 77x95         | VFL2L182#E095   |
|  | 2 200  | 10.0   | 21.0  | 53   | 50  | 18                   | 0.20  | 64x147        | VFL2L222#D147   |
|  |  | 11.3   | 23.7  | 53   | 50  | 20                   | 0.20  | 77x108        | VFL2L222#E108   |
|  | 2 700  | 11.3   | 23.7  | 40   | 35  | 18                   | 0.20  | 64x164        | VFL2L272#D164   |
|  |  | 12.8   | 26.9  | 40   | 35  | 20                   | 0.20  | 77x124        | VFL2L272#E124   |
| 14.5   | 30.5   | 40   | 35  | 20   | 0.20                                      | 90x97                | VFL2L272#F097   |               |   |

Additional designs on request · Weitere Designs auf Anfrage

# VFL · Screw-Terminal · 12000 h/85 °C

| Rated VoltageCode<br>(Surge Voltage)<br>$V_r$<br>[V DC]    | Capacitance<br>$C_r$<br>[μF]   | Ripple Current<br>at<br>85°C/120Hz<br>$I_r$<br>[A RMS] | Ripple Current<br>at<br>40°C/120Hz<br>[A RMS] | ESR (typ)<br>at<br>20°C/100Hz<br>[mΩ] | Zmax<br>at<br>20°C/10kHz<br>[mΩ] | ESL<br>(typ)<br>[nH] | Dissipation<br>Factor<br>at<br>20°C/120Hz<br>Tan δ | DxL<br>[mm] | Product Code<br># = variable value,<br>see fixing code<br>in the product code |
|--|--|--|---|---------------------------------------|----------------------------------|----------------------|--|-------------|---|
| <b>550 VDC</b><br>Code: 2L<br><br>Surge Voltage<br>600 VDC | 3 300  | 12.6   | 26.5  | 38                                    | 32                               | 20                   | 0.20   | 64x187      | VFL2L332#D187   |
|  |  | 13.9   | 29.2  | 38                                    | 32                               | 20                   | 0.20   | 77x148      | VFL2L332#E148   |
|  |  | 16.0   | 33.6  | 38                                    | 32                               | 20                   | 0.20   | 90x110      | VFL2L332#F110   |
|  | 3 900  | 15.4   | 32.3  | 30                                    | 27                               | 20                   | 0.20   | 77x165      | VFL2L392#E165   |
|  |  | 17.2   | 36.1  | 30                                    | 27                               | 20                   | 0.20   | 90x126      | VFL2L392#F126   |
|  | 4 700  | 17.0   | 35.7  | 25                                    | 20                               | 20                   | 0.20   | 77x188      | VFL2L472#E188   |
|  |  | 18.8   | 39.5  | 25                                    | 20                               | 20                   | 0.20   | 90x150      | VFL2L472#F150   |
|  | 5 600  | 21.4   | 44.9  | 20                                    | 17                               | 20                   | 0.20   | 90x150      | VFL2L562#F150   |
|  |  | 20.2   | 42.4  | 20                                    | 17                               | 20                   | 0.20   | 90x167      | VFL2L562#F167   |
|  | 6 800  | 22.4   | 47.0  | 17                                    | 17                               | 20                   | 0.20   | 90x190      | VFL2L682#F190   |
|  |  | 23.9   | 50.2  | 14                                    | 15                               | 20                   | 0.20   | 90x230      | VFL2L822#F230   |
|  | <b>600 VDC</b><br>Code:<br><b>600V</b><br><br>Surge Voltage<br>650 VDC | 1 200  | 7.0   | 14.7                                  | 122                              | 125                  | 18   | 0.20        | 64x94   |
| 8.0  |  |  | 16.8  | 111                                   | 114                              | 18                   | 0.20   | 64x123      | VFL600V152#D123   |
| 1 500  |  | 9.0  | 18.9  | 111                                   | 114                              | 20                   | 0.20   | 77x95       | VFL600V152#E095   |
|  |  | 8.6  | 18.1  | 99                                    | 102                              | 18                   | 0.20   | 64x147      | VFL600V182#D147   |
| 1 800  |  | 9.8  | 20.6  | 99                                    | 102                              | 20                   | 0.20   | 77x108      | VFL600V182#E108   |
|  |  | 9.8  | 20.6  | 85                                    | 87                               | 18                   | 0.20   | 64x164      | VFL600V222#D164   |
| 2 200  |  | 11.1   | 23.3  | 85                                    | 87                               | 20                   | 0.20   | 77x124      | VFL600V222#E124   |
|  |  | 12.6   | 26.5  | 85                                    | 87                               | 20                   | 0.20   | 90x97       | VFL600V222#F097   |
| 2 700  |  | 10.9   | 22.9  | 66                                    | 68                               | 18                   | 0.20   | 64x187      | VFL600V272#D187   |
|  |  | 13.8   | 29.0  | 66                                    | 68                               | 20                   | 0.20   | 90x110      | VFL600V272#F110   |
| 3 300  |  | 13.3   | 27.9  | 44                                    | 45                               | 20                   | 0.20   | 77x148      | VFL600V332#E148   |
|  |  | 15.2   | 31.9  | 44                                    | 45                               | 20                   | 0.20   | 90x126      | VFL600V332#F126   |
| 3 900  |  | 14.9   | 31.3  | 33                                    | 25                               | 20                   | 0.20   | 77x188      | VFL600V392#E188   |
|  |  | 16.4   | 34.4  | 33                                    | 25                               | 20                   | 0.20   | 90x150      | VFL600V392#F150   |
| 4 700  |  | 16.9   | 35.5  | 27                                    | 20                               | 20                   | 0.20   | 77x228      | VFL600V472#E228   |
|  |  | 17.7   | 37.2  | 27                                    | 20                               | 20                   | 0.20   | 90x167      | VFL600V472#F167   |
| 5 600  |  | 19.5   | 41.0  | 23                                    | 17                               | 20                   | 0.20   | 90x190      | VFL600V562#F190   |
|  |  | 20.9   | 43.9  | 19                                    | 14                               | 20                   | 0.20   | 90x230      | VFL600V682#F230   |

Additional designs on request · Weitere Designs auf Anfrage

## > Ripple Current Multiplier · Wechselstrommultiplikator

| Frequency [Hz] | 50/60 | 120  | 300  | 1k   | ≥ 10k | Forced cooling [m/sec] | v < 0.5 | v ≥ 0.5 | v ≥ 2.0 | v ≥ 3.0 |
|----------------|-------|------|------|------|-------|------------------------|---------|---------|---------|---------|
| Multiplier     | 0.80  | 1.00 | 1.18 | 1.34 | 1.45  | Multiplier             | 1.00    | 1.10    | 1.20    | 1.25    |

| Ta (°C)    | 40  | 45  | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Multiplier | 2.1 | 2.0 | 1.9 | 1.8 | 1.7 | 1.5 | 1.3 | 1.2 | 1.1 | 1.0 |

> Life Time Table · Brauchbarkeitsdauer – Tabelle

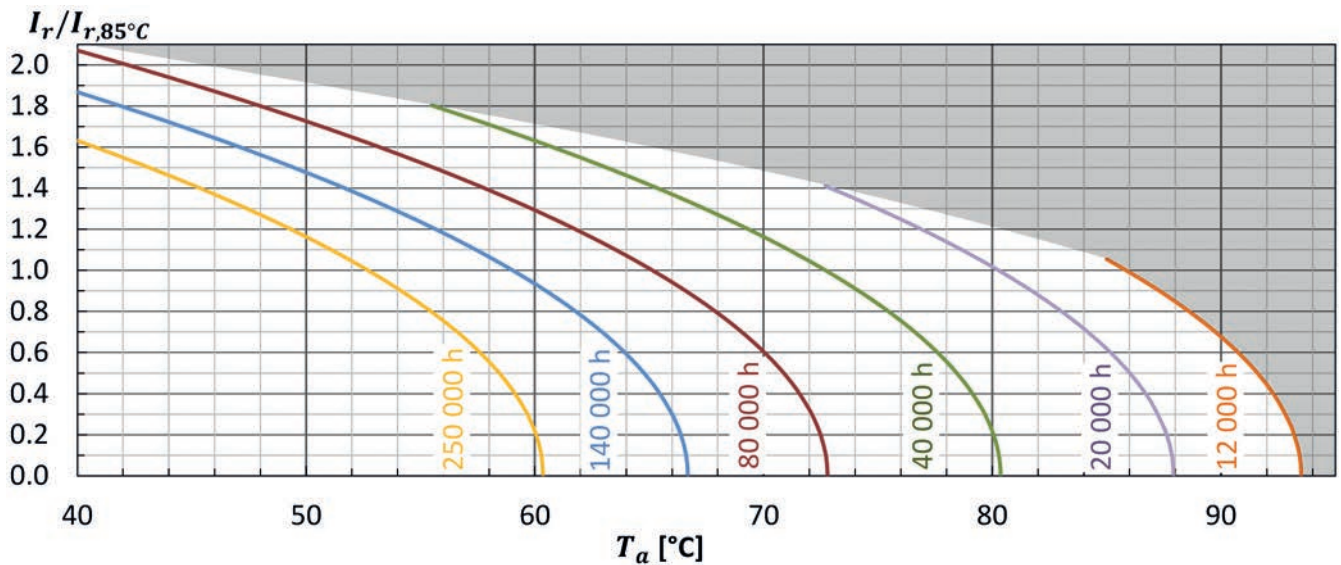
| VFL           | Useful life as function of ambient temperature and ripple current |       |       |       |       |       |       |       |       |       |       |       |
|---------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| $I_r$ at 85°C | 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 |
| $T_a = 40°C$  | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 212   | 166   | 128   | 97    | 73    |
| $T_a = 45°C$  | 250   | 250   | 250   | 250   | 250   | 210   | 169   | 134   | 105   | 81    | 61    |       |
| $T_a = 50°C$  | 250   | 250   | 235   | 197   | 163   | 133   | 107   | 85    | 66    | 51    |       |       |
| $T_a = 55°C$  | 202   | 174   | 148   | 124   | 103   | 84    | 67    | 53    | 42    |       |       |       |
| $T_a = 60°C$  | 128   | 110   | 94    | 79    | 65    | 53    | 42    | 34    |       |       |       |       |
| $T_a = 65°C$  | 81  | 69    | 59    | 49    | 41    | 33    |       |       |       |       |       |       |
| $T_a = 70°C$  | 51  | 44    | 37    | 31    |       |       |       |       |       |       |       |       |
| $T_a = 75°C$  | 32  | 27    | 23    |       |       |       |       |       |       |       |       |       |
| $T_a = 80°C$  | 20  | 17    |       |       |       |       |       |       |       |       |       |       |
| $T_a = 85°C$  | 12  |       |       |       |       |       |       |       |       |       |       |       |

khrs      Max. value limited to 250 000 hours.

> Life Time Graph · Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature  $T_a$  and ripple current operating conditions  $I_r$  versus rated ripple current at the upper category temperature  $I_{r, 85°C, 120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur  $T_a$  und Wechselstrombelastung  $I_r$  im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorie-temperatur  $I_{r, 85°C, 120Hz}$



> Life Time Tests and Requirements · Anforderungen Brauchbarkeitsdauer

| Life time test | Test procedure                                | Life time criteria  |
|----------------|---|---|
| Endurance test | $T_a = 85°C$ ; $V_r, I_r$ applied 8000 hours  | $\Delta C/C \leq 10\%$ (of initial value)<br>$\tan\delta \leq 175\%$ (of specified value)<br>$I_L \leq$ specified value |
| Useful life    | $T_a = 85°C$ ; $V_r, I_r$ applied 12000 hours | $\Delta C/C \leq 15\%$ (of initial value)<br>$\tan\delta < 200\%$ (of specified value)<br>$I_L \leq$ specified value    |

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4