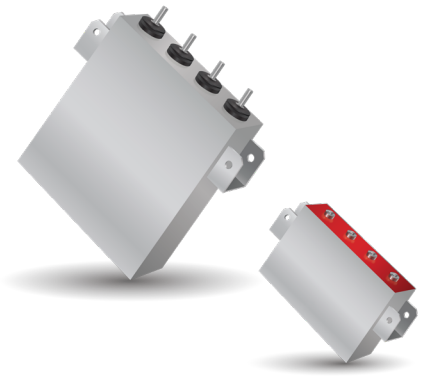
# DC FILTERING

## FFHV/FTHV 1600Vdc to 2300Vdc



The FFHV and FTHV series are specifically designed for DC filtering applications such as DC link or resonant filters for voltages up to 2300V.

These capacitors are proposed in 2 different versions: resin top for the FFHV series and hermetic case for the FTHV.

Large case sizes up to 36 liters and high specific energy up to 455J/l* together with safe and reliable ***Controlled Self Healing Technology*** make this series particularly suitable for power converters in traction, drives, renewable energy and power transmission areas.
*for 100,000 hours and 70°C hot spot temperature

FFHV and FTHV use a wet solution with polypropylene metallized film and oil (without free oil).

Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance values.

In case of specific requirements about shape and performances, feel free to contact your local KYOCERA AVX representative.

## PACKAGING MATERIAL

| FFHV | FTHV |
|---|---|
| Non-painted rectangular resin filled aluminium case<br>Mounting brackets<br>M8/17 female connections or M12/30 male connections<br>2 or 4 connections<br>Self-extinguishing thermosetting protection resin (V-0: in accordance with UL 94 certified classifications according to EN 45545-2) | Non-painted rectangular aluminium hermetic case<br>Mounting brackets<br>M8/17 female terminals or M12/30 male terminals<br>2 or 4 terminals<br>Self-extinguishing thermosetting technology body (certified classifications according to EN 45545-2) |

## STANDARDS

| FFHV | FTHV |
|---|---|
| **IEC 61071:** Capacitors for power electronics<br>**IEC 61881:** Railway applications - Rolling stock equipment - Capacitors for power electronics<br>**IEC 61373:** Railways application - Rolling stock equipment - Shock and vibrations tests<br>**IEC 60068-1:** Environmental testing. Part 1: general and guidance<br>**UL 94:** Tests for flammability of Plastic Materials for Parts in Devices and Appliances<br>**EN 45545:** Railways applications – Fire protection on railway vehicles. | **IEC 61071:** Capacitors for power electronics<br>**IEC 61881:** Railway applications - Rolling stock equipment - Capacitors for power electronics<br>**IEC 61373:** Railways application - Rolling stock equipment - Shock and vibrations tests<br>**IEC 60068-1:** Environmental testing. Part 1: general and guidance<br>**EN 45545-2:** Railways applications – Fire protection on railway vehicles. |

## HOW TO ORDER

| D | FFHV | 1 | 1 | M | R | 2637 |
|---|---|---|---|---|---|---|
| | **Series**<br>FFHV: resin top | **Section and Option**<br>1 = 340x125 2 connections<br>2 = 340x125 4 connections<br>3 = 340x175 2 connections<br>4 = 340x175 4 connections | **Height**<br>1 = 230mm<br>2 = 295mm<br>3 = 370mm<br>4 = 450mm<br>5 = 530mm<br>6 = 610mm | **Terminal Code**<br>F = Female<br>M = Male | **Voltage**<br>A = 1600V<br>B = 1900V<br>C = 2000V<br>D = 2150V | **Capacitance EIA Code** |

| D | FTHV | 1 | 1 | M | R | 2637 |
|---|---|---|---|---|---|---|
| | **Series**<br>FTHV: hermetic case | **Section and Option**<br>1 = 340x125 2 terminals<br>2 = 340x125 4 terminals<br>3 = 340x175 2 terminals<br>4 = 340x175 4 terminals | **Height**<br>1 = 240mm<br>2 = 305mm<br>3 = 380mm<br>4 = 460mm<br>5 = 540mm<br>6 = 620mm | **Terminal Code**<br>F = Female<br>M = Male | **Voltage**<br>A = 1600V<br>B = 1900V<br>C = 2000V<br>D = 2150V | **Capacitance EIA Code** |

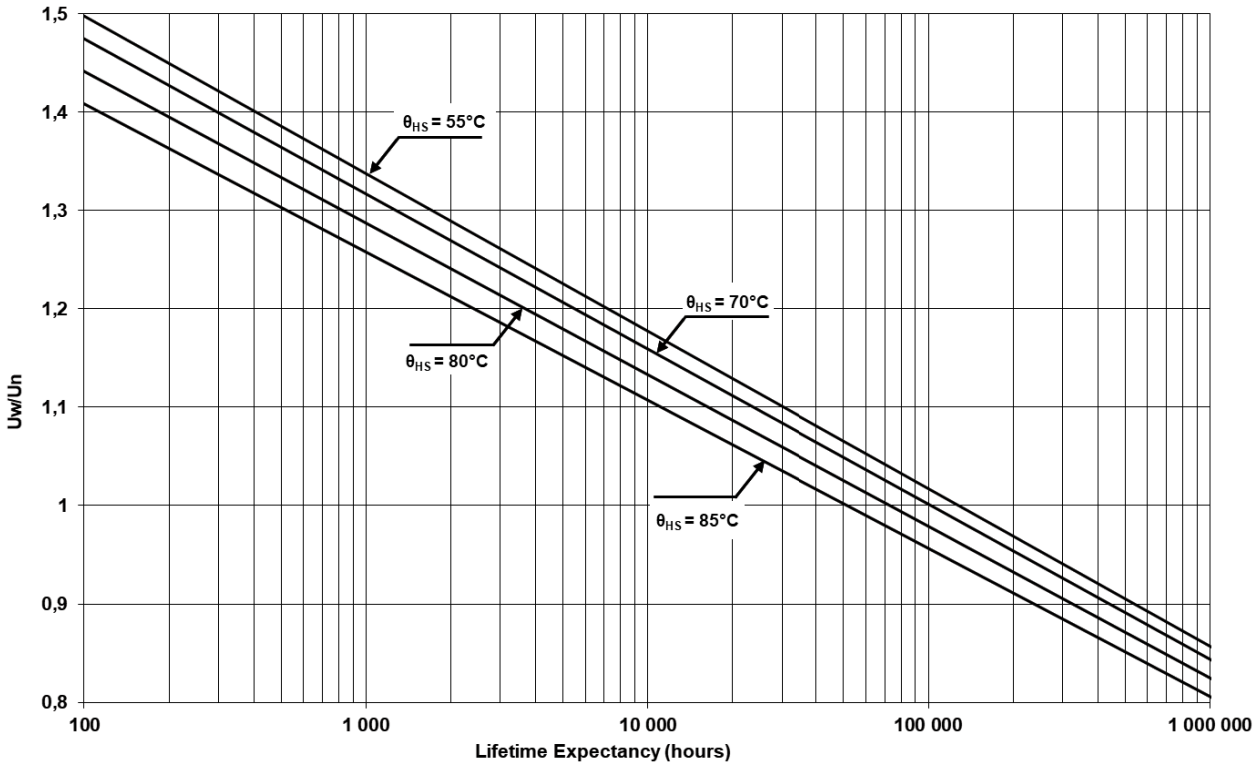
## DEFINITIONS

| | | |
|---|---|---|
| **$C_n$ (µF)** | capacitance | nominal value of the capacitance measured at $\theta_{amb}$ = 25 ± 10°C |
| **$U_n$ (V)** | rated DC voltage | maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation |
| **$U_w$ (V)** | working voltage | value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime |
| **$U_r$ (V)** | ripple voltage | peak-to-peak alternating component of the unidirectional voltage |
| **$L_s$ (nH)** | parasitic inductance | capacitor series self-inductance |
| **$R_s$ (mΩ)** | series resistance | capacitor series resistance due to galvanic circuit @ ambient temperature |
| **$I_{rms}$ thermal 1 (A)** | RMS current | rms current value @ 100Hz for continuous operation under natural convection generating 20°C overheating (255Arms maximum for 2 connexions or terminals and 400Arms maximum for 4 connexions or terminals) |
| **$I_{rms}$ thermal 2 (A)** | RMS current | rms current value @ 100Hz for continuous operation under forced air generating 20°C overheating (255$A_{rms}$ maximum for 2 connexions or terminals and 400Arms maximum for 4 connexions or terminals) |
| **$\theta_{amb}$ (°C)** | cooling air temperature | temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units<br>NOTE If only one unit is involved, it is the temperature measured at a point approximately 0,1 m away from the capacitor container and at two-thirds of the height from its base |
| **$\theta_{HS}$ (°C)** | hot spot temperature | highest temperature obtained inside the case of the capacitor in thermal equilibrium |

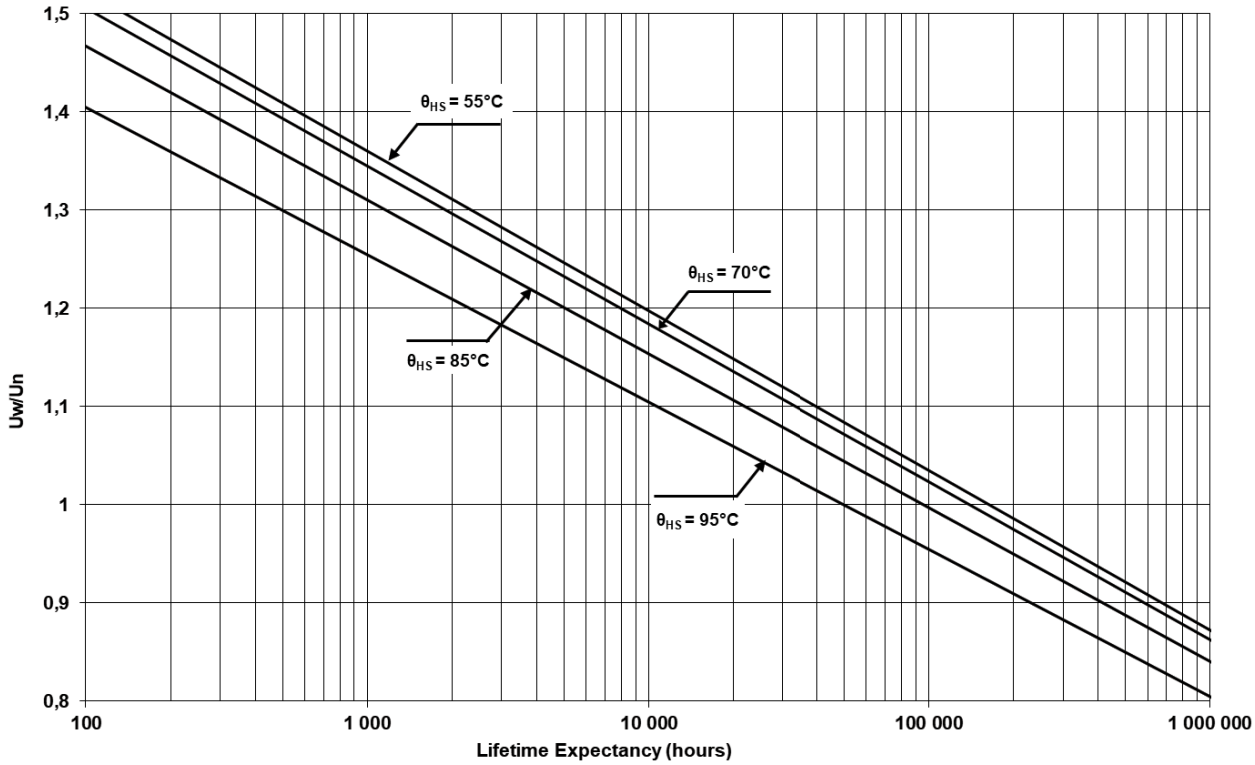
## CHARACTERISTICS

| | |
|---|---|
| **Capacitance range $C_n$** | 1440µF to 12600µF |
| **Tolerance on $C_n$** | ±10% |
| **Rated DC voltage $U_n$** | 1600 to 2300V |
| **Lifetime at $U_n$ and ΔC / C < 2%** | FFHV: 100,000h @ 70°C hot spot temperature<br>FTHV: 100,000h @ 85°C hot spot temperature |
| **Parasitic inductance $L_s$** | 27nH to 88nH |
| **Maximum rms current $I_{rms}$** | up to 400$A_{rms}$ |
| **Test voltage between terminals @ 25°C** | 1.5 x $U_n$ for 10s |
| **Test voltage between terminals and Case @ 25°C** | 7k$V_{rms}$ @ 50Hz for 10s |
| **Dielectric** | polypropylene |
| **Climatic Category** | FFHV: 40 / 85 / 56 (IEC 60068)<br>FTHV: 40 / 95 / 56 (IEC 60068) |
| **Working temperature** | FFHV: -40°C / +85°C (according to the power dissipated)<br>FTHV: -40°C / +95°C (according to the power dissipated) |
| **Storage temperature** | -40°C / +85°C |
| **Calorific value** | 34 MJ/kg |

## FFHV LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE




## FTHV LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



## HOW TO CHOSE THE RIGHT CAPACITOR

The capacitor lifetime depends on the working voltage and the hot spot temperature.

Our caps are designed to meet 100000 hours lifetime at rated voltage and 70°C (for FFHV) or 85°C (for FTHV) hot spot temperature. In accordance with operating conditions, please calculate the hot spot temperature and deduce from this calculation if the obtained lifetime can suit the application.

**1. From the tables, select a capacitor with required capacitance $C_n$ and voltage $U_n$.**

Calculate the maximum ripple voltage allowed for the selected cap:
$U_{rmax} = 0.2U_n$

If $U_r > U_{rmax}$, select a capacitor with higher rated voltage

Make sure $I_{rms}$ application < $I_{rms}$ table

Copy out:

- serial resistance ($R_s$): see table of values
- thermal resistances $R_{th1}$ and $R_{th2}$ (depending on cooling conditions)

**2. Hot spot temperature calculation**

Total losses are calculated as follow: $P_t = P_j + P_d$

Joule losses: $P_j = R_s \times (I_{rms})^2$

Dielectric losses: $P_d = Q \times tg\delta_0$ with

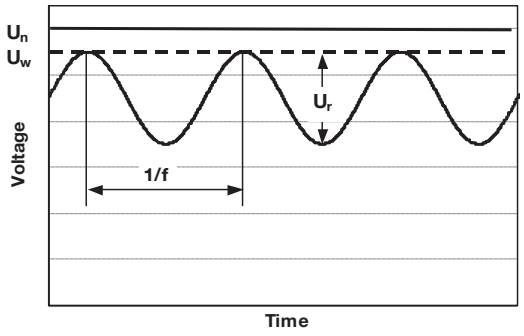
- Q(reactive power) = $\frac{(I_{rms})^2}{C2\pi f}$ for a waveform of f frequency
- $tg\delta_0 = 3 \times 10^{-4}$ (dielectric losses of polypropylene)

Hot spot temperature will be:
$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times (R_{th1} + R_{th2})$

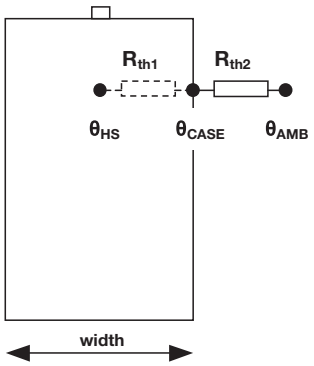
$\theta_{HS}$ ***absolute maximum is:***

***85°C for FFHV***
***or 95°C for FTHV***

If temperature is higher than 85°C, come back to #1 and start again with another selection.

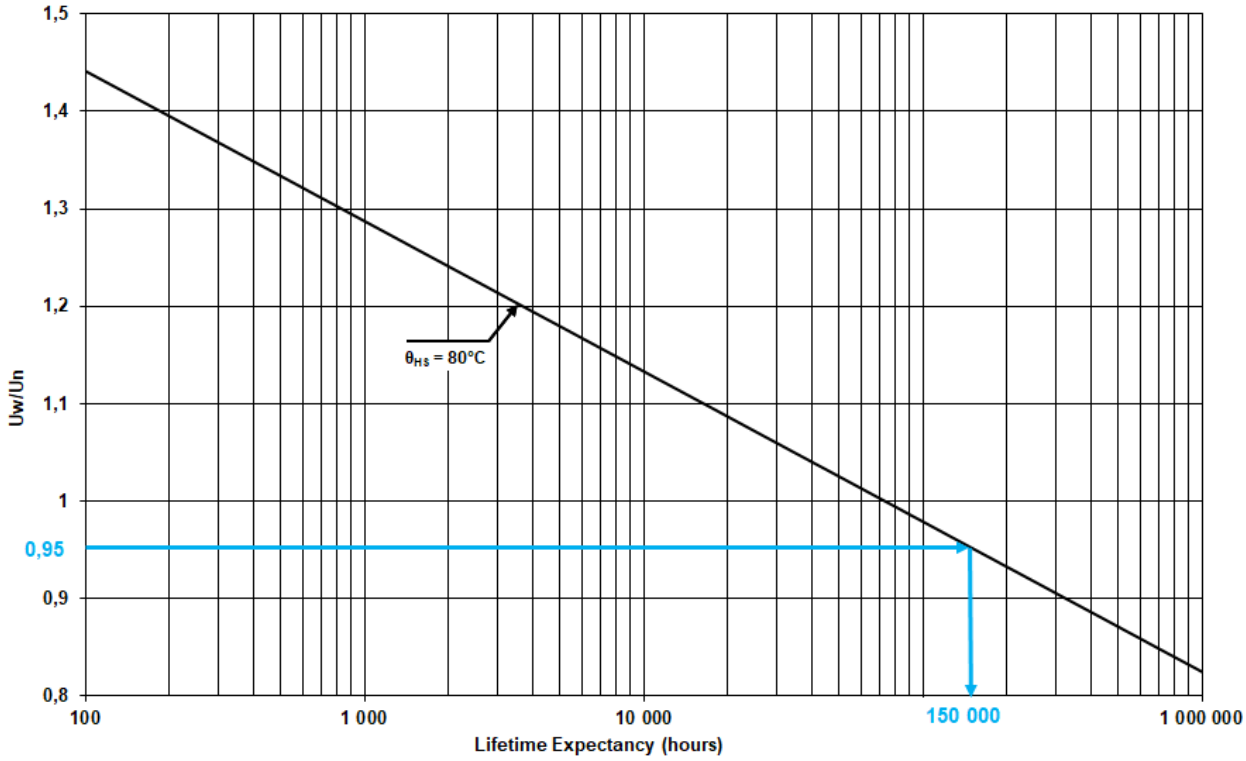



$R_{th1}$: Thermal resistance between hot spot and case
$R_{th2}$: Thermal resistance between case and ambient air



**3. Refer to the curve and deduce the lifetime vs $U_w/U_n$ ratio**

## FFHV LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE




eg: rated voltage 2000V
working voltage 1900V
ρ = 0.95 ⇒ lifetime 150,000 hours @ 80°C hot spot temperature

Please, find a calculation form at the end of the catalog

## THERMAL RESISTANCES

**$R_{th1}$ (°C/W): Thermal resistance between hot spot and case**

| Rth1 (°C/W) | | |
|---|---|---|
| Height (mm) | Width (mm) | |
| | 125 | 175 |
| 230/240 | 0.40 | 0.41 |
| 295/305 | 0.33 | 0.36 |
| 370/380 | 0.27 | 0.30 |
| 450/460 | 0.22 | 0.26 |
| 530/540 | 0.19 | 0.22 |
| 610/620 | 0.17 | 0.19 |

**$Rth_2$ (°C/W): Thermal resistance between case and ambient air under natural convection and forced air**

| | Rth2 (°C/W) | | | |
|---|---|---|---|---|
| | Natural air cooling | | Forced air cooling >2m/s | |
| Height (mm) | Width (mm) | | Width (mm) | |
| | 125 | 175 | 125 | 175 |
| 230/240 | 0.3 | 0.26 | 0.15 | 0.13 |
| 295/305 | 0.25 | 0.21 | 0.13 | 0.11 |
| 370/380 | 0.2 | 0.18 | 0.1 | 0.09 |
| 450/460 | 0.17 | 0.15 | 0.09 | 0.08 |
| 530/540 | 0.15 | 0.13 | 0.08 | 0.07 |
| 610/620 | 0.13 | 0.11 | 0.07 | 0.06 |

**For confined area, capacitor working in a closed cabinet, a thermal test under real conditions is necessary to evaluate the thermal resistance.**

## PARASITIC INDUCTANCE VS SIZE

**Measurement @ 1MHz**

| $L_s$ (nH) FFHV resin top | | | | |
|---|---|---|---|---|
| Height (mm) | Width (mm) | | | |
| | 2 Connections | | 4 Connections | |
| | 125 | 175 | 125 | 175 |
| 230 | 70 | 73 | 27 | 30 |
| 295 | 72 | 77 | 29 | 34 |
| 370 | 75 | 82 | 32 | 39 |
| 450 | 79 | 86 | 36 | 43 |
| 530 | 82 | 91 | 39 | 48 |
| 610 | 85 | 96 | 42 | 53 |

| $L_s$ (nH) FTHV hermetic case | | | | |
|---|---|---|---|---|
| Height (mm) | Width (mm) | | | |
| | 2 Connections | | 4 Connections | |
| | 125 | 175 | 125 | 175 |
| 240 | 73 | 76 | 28 | 31 |
| 305 | 75 | 80 | 30 | 35 |
| 380 | 78 | 85 | 33 | 40 |
| 460 | 82 | 89 | 37 | 44 |
| 540 | 85 | 94 | 40 | 49 |
| 620 | 88 | 99 | 43 | 54 |

## MTBF CALCULATION

Based on Return Of Experience from the field of more than 30 years, we have established the following relation. The failure rate $\lambda_B$ depends on hot spot temperature $\theta_{HS}$ and charge ratio ρ.

$\rho = U_w/U_n$

$$\lambda_B = 3.10^{\,3,66(\rho-1)} \times .e^{\,4,5\left(\frac{273+\theta_{HS}}{368}\right)^{25}} \times .10^{-9} \text{ in failures/hour}$$

## GENERAL FAILURE RATE

$\lambda=\lambda_B$ x $\pi_Q$ x $\pi_B$ x $\pi_E$ failures/hour • $\pi_Q$, $\pi_B$ and $\pi_E$ see following tables

| Qualification | Qualification factor πQ |
|---|---|
| Product qualified on IEC61071 and internal qualification | 1 |
| Product qualified on IEC61071 | 2 |
| Product answering on another norm | 5 |
| Product without qualification | 15 |

| Environment | Environment factor πE |
|---|---|
| On ground (good conditions) | 1 |
| On ground (fixed materials) | 2 |
| On ground (on board) | 4 |
| On ship | 9 |
| On plane | 15 |

| Environment | Environment factor πB |
|---|---|
| Favorable | 1 |
| Unfavourable | 5 |

## MEAN TIME BETWEEN FAILURE (MTBF)

MTBF = 1/λ hours

## SURVIVAL FUNCTION

$N = N_0$ x exp (-λt)

N is the number of pieces still working after t hours.

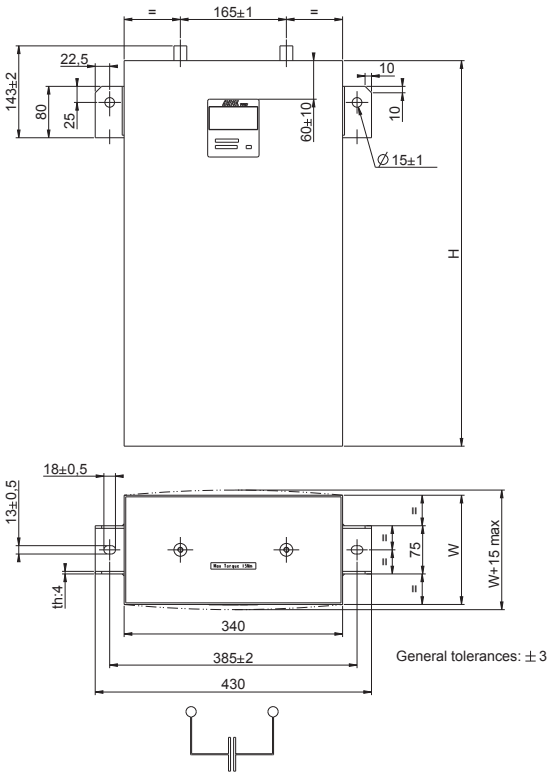
$N_0$ is the number of pieces at the origin (t = 0)

## FAILURE MODE

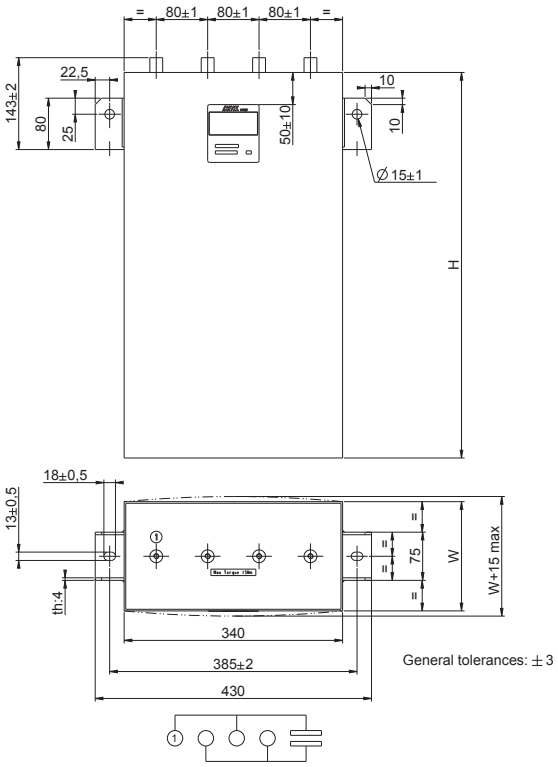
Main failure mode due to KYOCERA AVX's **Controlled Self-Healing Technology** is only losses of capacitance. Thanks to **Controlled Self-Healing** solution to interrupt self-healing process in order to prevent avalanche effect due to polypropylene molecular cracking producing gas and potential explosion in confined box for none **Controlled Self-Healing capacitors.**

## DIMENSIONS

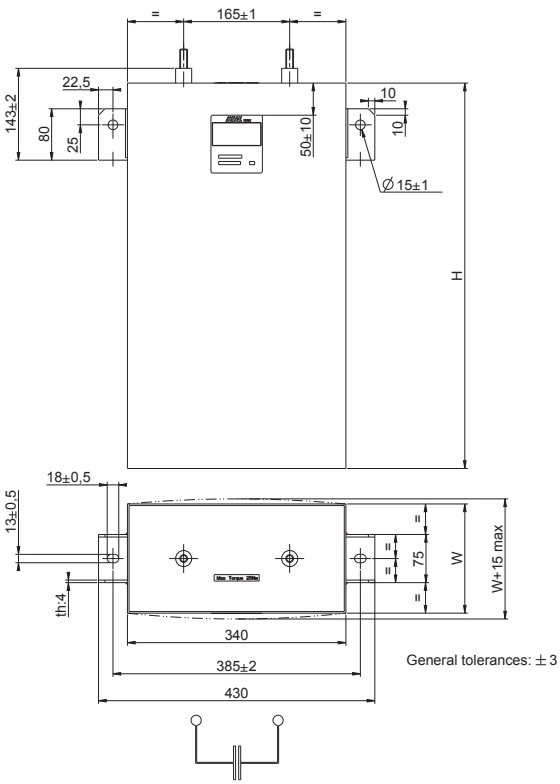
### 2 FEMALE CONNECTIONS



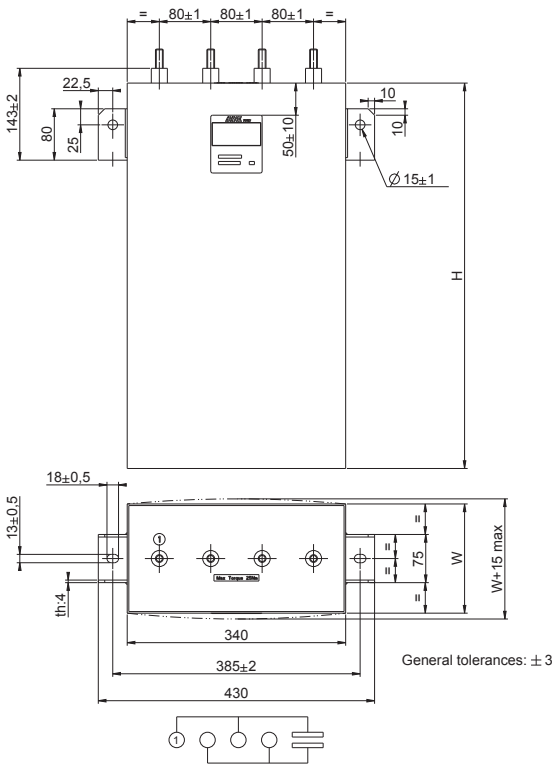

### 4 FEMALE CONNECTIONS




### 2 MALE CONNECTIONS

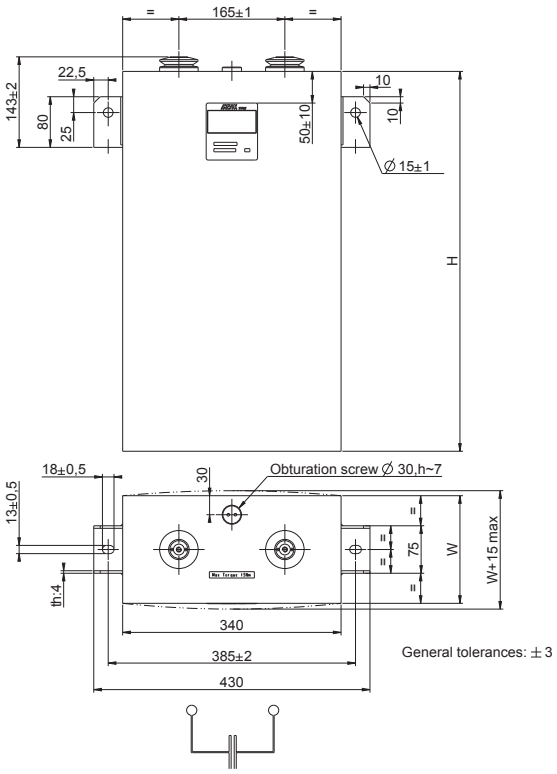



### 4 MALE CONNECTIONS

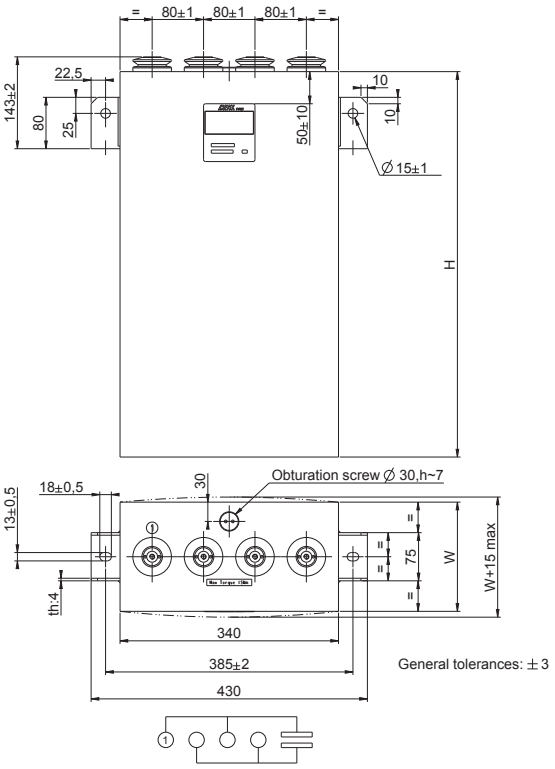


## DIMENSIONS

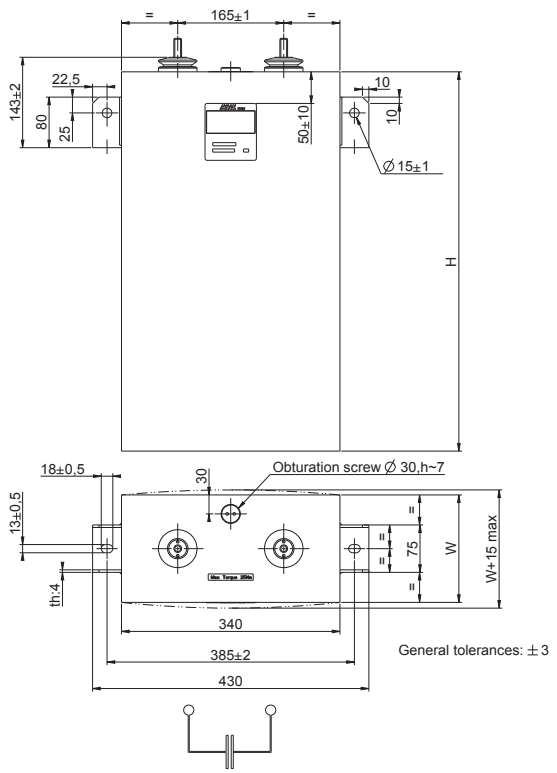
### 2 FEMALE TERMINALS



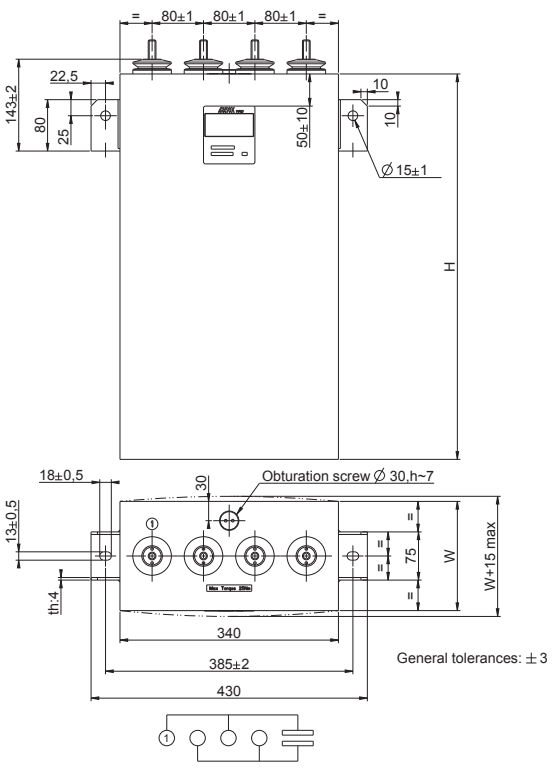

### 4 FEMALE TERMINALS




### 2 MALE TERMINALS

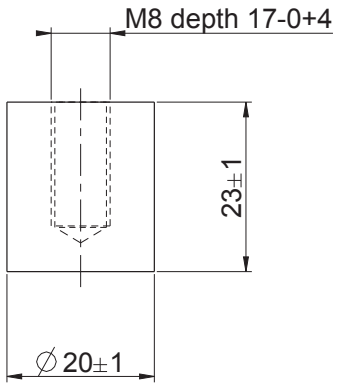



### 4 MALE TERMINALS

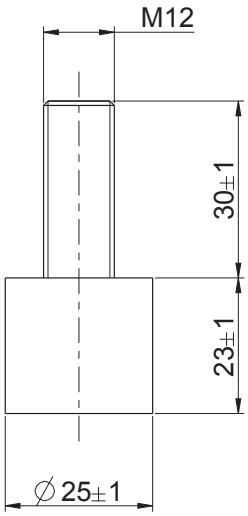


## DIMENSIONS

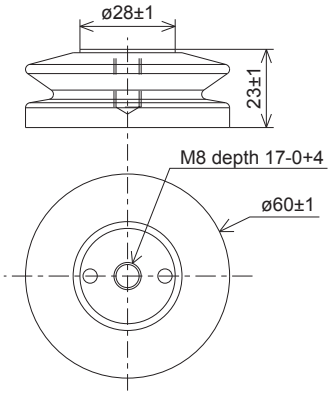
**FEMALE CONNECTIONS (max torque 15Nm)**




**MALE CONNECTIONS (max torque 25Nm)**

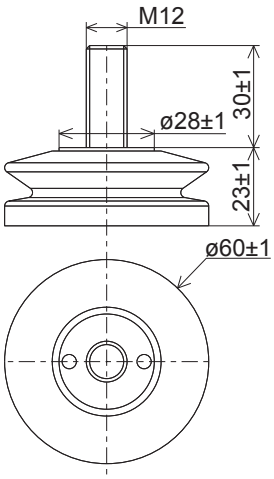



**FEMALE TERMINAL (max torque 15Nm)**




Creepage distance : 52mm
Air distance : 30mm

**MALE TERMINAL (max torque 25Nm)**




Creepage distance : 52mm
Air distance : 30mm

## WEIGHT VS SIZE

| Weight (kg) FFHV resin top | | | | |
|---|---|---|---|---|
| Height (mm) | Width (mm) | | | |
| | 2 Connections | | 4 Connections | |
| | 125 | 175 | 125 | 175 |
| 230 | 13 | 17.5 | 13.5 | 18 |
| 295 | 17 | 22.5 | 17.5 | 23 |
| 370 | 21 | 27.5 | 21.5 | 28 |
| 450 | 25 | 33.5 | 25.5 | 34 |
| 530 | 29 | 39 | 29.5 | 39.5 |
| 610 | 33.5 | 44.5 | 34 | 45 |

| Weight (kg) FTHV hermetic case | | | | |
|---|---|---|---|---|
| Height (mm) | Width (mm) | | | |
| | 2 Connections | | 4 Connections | |
| | 125 | 175 | 125 | 175 |
| 240 | 14.5 | 19 | 15 | 19.5 |
| 305 | 18 | 24 | 18.5 | 24.5 |
| 380 | 22 | 29.5 | 22.5 | 30 |
| 460 | 26.5 | 35 | 27 | 35.5 |
| 540 | 30.5 | 40.5 | 31 | 41 |
| 620 | 34.5 | 46 | 35 | 46.5 |

## TABLE OF VALUES

| Part Number | Capacitance (µF) | Width (mm) | Height (mm) | | $R_s$ (mΩ) | $I_{rms}$ Thermal 1 (A) | $I_{rms}$ Thermal 2 (A) |
|---|---|---|---|---|---|---|---|
| | | | FFHV | FTHV | | | |
| **Un = 1600Vdc** | | | | | | | |
| DF*HV11°A2637 | 2630 | 125 | 230 | 240 | 0,42 | 215 | 240 |
| DF*HV21°A2637 | 2630 | 125 | 230 | 240 | 0,35 | 230 | 255 |
| DF*HV12°A3447 | 3440 | 125 | 295 | 305 | 0,36 | 255 | 255 |
| DF*HV22°A3447 | 3440 | 125 | 295 | 305 | 0,29 | 285 | 320 |
| DF*HV31°A4127 | 4120 | 175 | 230 | 240 | 0,57 | 205 | 230 |
| DF*HV41°A4127 | 4120 | 175 | 230 | 240 | 0,48 | 220 | 245 |
| DF*HV13°A4597 | 4590 | 125 | 370 | 380 | 0,32 | 255 | 255 |
| DF*HV23°A4597 | 4590 | 125 | 370 | 380 | 0,25 | 345 | 390 |
| DF*HV32°A5407 | 5400 | 175 | 295 | 305 | 0,48 | 245 | 255 |
| DF*HV42°A5407 | 5400 | 175 | 295 | 305 | 0,39 | 270 | 300 |
| DF*HV14°A5747 | 5740 | 125 | 450 | 460 | 0,30 | 255 | 255 |
| DF*HV24°A5747 | 5740 | 125 | 450 | 460 | 0,23 | 400 | 400 |
| DF*HV15°A6897 | 6890 | 125 | 530 | 540 | 0,29 | 255 | 255 |
| DF*HV25°A6897 | 6890 | 125 | 530 | 540 | 0,22 | 400 | 400 |
| DF*HV33°A7207 | 7200 | 175 | 370 | 380 | 0,42 | 255 | 255 |
| DF*HV43°A7207 | 7200 | 175 | 370 | 380 | 0,33 | 325 | 360 |
| DF*HV16°A8047 | 8040 | 125 | 610 | 620 | 0,28 | 255 | 255 |
| DF*HV26°A8047 | 8040 | 125 | 610 | 620 | 0,21 | 400 | 400 |
| DF*HV34°A9007 | 9000 | 175 | 450 | 460 | 0,39 | 255 | 255 |
| DF*HV44°A9007 | 9000 | 175 | 450 | 460 | 0,30 | 375 | 400 |
| DF*HV35°A1088 | 10800 | 175 | 530 | 540 | 0,37 | 255 | 255 |
| DF*HV45°A1088 | 10800 | 175 | 530 | 540 | 0,28 | 400 | 400 |
| DF*HV36°A1268 | 12600 | 175 | 610 | 620 | 0,36 | 255 | 255 |
| DF*HV46°A1268 | 12600 | 175 | 610 | 620 | 0,27 | 400 | 400 |
| **Un = 1900Vdc** | | | | | | | |
| DF*HV11°B1917 | 1910 | 125 | 230 | 240 | 0,46 | 200 | 225 |
| DF*HV21°B1917 | 1910 | 125 | 230 | 240 | 0,39 | 210 | 235 |
| DF*HV12°B2507 | 2500 | 125 | 295 | 305 | 0,39 | 245 | 255 |
| DF*HV22°B2507 | 2500 | 125 | 295 | 305 | 0,32 | 260 | 295 |
| DF*HV31°B3007 | 3000 | 175 | 230 | 240 | 0,63 | 195 | 215 |
| DF*HV41°B3007 | 3000 | 175 | 230 | 240 | 0,54 | 205 | 225 |
| DF*HV13°B3347 | 3340 | 125 | 370 | 380 | 0,34 | 255 | 255 |
| DF*HV23°B3347 | 3340 | 125 | 370 | 380 | 0,27 | 320 | 360 |
| DF*HV32°B3927 | 3920 | 175 | 295 | 305 | 0,53 | 230 | 255 |
| DF*HV42°B3927 | 3920 | 175 | 295 | 305 | 0,44 | 250 | 275 |
| DF*HV14°B4177 | 4170 | 125 | 450 | 460 | 0,32 | 255 | 255 |
| DF*HV24°B4177 | 4170 | 125 | 450 | 460 | 0,25 | 375 | 400 |
| DF*HV15°B5017 | 5010 | 125 | 530 | 540 | 0,31 | 255 | 255 |
| DF*HV25°B5017 | 5010 | 125 | 530 | 540 | 0,24 | 400 | 400 |
| DF*HV33°B5227 | 5220 | 175 | 370 | 380 | 0,46 | 255 | 255 |
| DF*HV43°B5227 | 5220 | 175 | 370 | 380 | 0,37 | 300 | 335 |
| DF*HV16°B5847 | 5840 | 125 | 610 | 620 | 0,30 | 255 | 255 |
| DF*HV26°B5847 | 5840 | 125 | 610 | 620 | 0,23 | 400 | 400 |
| DF*HV34°B6537 | 6530 | 175 | 450 | 460 | 0,42 | 255 | 255 |
| DF*HV44°B6537 | 6530 | 175 | 450 | 460 | 0,33 | 350 | 390 |
| DF*HV35°B7837 | 7830 | 175 | 530 | 540 | 0,39 | 255 | 255 |
| DF*HV45°B7837 | 7830 | 175 | 530 | 540 | 0,30 | 395 | 400 |
| DF*HV36°B9147 | 9140 | 175 | 610 | 620 | 0,38 | 255 | 255 |
| DF*HV46°B9147 | 9140 | 175 | 610 | 620 | 0,29 | 400 | 400 |

* Insert F for resin top or T for hermetic case

° Insert F for female terminals or M for male terminals

## TABLE OF VALUES

| Part Number | Capacitance (µF) | Width (mm) | Height (mm) | | $R_s$ (mΩ) | $I_{rms}$ Thermal 1 (A) | $I_{rms}$ Thermal 2 (A) |
|---|---|---|---|---|---|---|---|
| | | | FFHV | FTHV | | | |
| **Un = 2000Vdc** | | | | | | | |
| DF*HV11°C1627 | 1620 | 125 | 230 | 240 | 0.49 | 190 | 215 |
| DF*HV21°C1627 | 1620 | 125 | 230 | 240 | 0.41 | 200 | 225 |
| DF*HV12°C2137 | 2130 | 125 | 295 | 305 | 0.42 | 230 | 255 |
| DF*HV22°C2137 | 2130 | 125 | 295 | 305 | 0.34 | 245 | 280 |
| DF*HV31°C2547 | 2540 | 175 | 230 | 240 | 0.65 | 185 | 210 |
| DF*HV41°C2547 | 2540 | 175 | 230 | 240 | 0.56 | 200 | 220 |
| DF*HV13°C2847 | 2840 | 125 | 370 | 380 | 0.37 | 255 | 255 |
| DF*HV23°C2847 | 2840 | 125 | 370 | 380 | 0.29 | 305 | 340 |
| DF*HV32°C3337 | 3330 | 175 | 295 | 305 | 0.55 | 225 | 250 |
| DF*HV42°C3337 | 3330 | 175 | 295 | 305 | 0.46 | 240 | 265 |
| DF*HV14°C3547 | 3540 | 125 | 450 | 460 | 0.35 | 255 | 255 |
| DF*HV24°C3547 | 3540 | 125 | 450 | 460 | 0.27 | 355 | 400 |
| DF*HV15°C4257 | 4250 | 125 | 530 | 540 | 0.33 | 255 | 255 |
| DF*HV25°C4257 | 4250 | 125 | 530 | 540 | 0.25 | 400 | 400 |
| DF*HV33°C4447 | 4440 | 175 | 370 | 380 | 0.48 | 255 | 255 |
| DF*HV43°C4447 | 4440 | 175 | 370 | 380 | 0.39 | 290 | 320 |
| DF*HV16°C4967 | 4960 | 125 | 610 | 620 | 0.32 | 255 | 255 |
| DF*HV26°C4967 | 4960 | 125 | 610 | 620 | 0.24 | 400 | 400 |
| DF*HV34°C5557 | 5550 | 175 | 450 | 460 | 0.43 | 255 | 255 |
| DF*HV44°C5557 | 5550 | 175 | 450 | 460 | 0.34 | 340 | 375 |
| DF*HV35°C6657 | 6650 | 175 | 530 | 540 | 0.41 | 255 | 255 |
| DF*HV45°C6657 | 6650 | 175 | 530 | 540 | 0.32 | 385 | 400 |
| DF*HV36°C7767 | 7760 | 175 | 610 | 620 | 0.39 | 255 | 255 |
| DF*HV46°C7767 | 7760 | 175 | 610 | 620 | 0.3 | 400 | 400 |
| **Un = 2150Vdc** | | | | | | | |
| DF*HV11°D1447 | 1440 | 125 | 230 | 240 | 0,50 | 180 | 200 |
| DF*HV21°D1447 | 1440 | 125 | 230 | 240 | 0,43 | 185 | 210 |
| DF*HV12°D1887 | 1880 | 125 | 295 | 305 | 0,42 | 225 | 255 |
| DF*HV22°D1887 | 1880 | 125 | 295 | 305 | 0,35 | 240 | 270 |
| DF*HV31°D2257 | 2250 | 175 | 230 | 240 | 0,69 | 175 | 195 |
| DF*HV41°D2257 | 2250 | 175 | 230 | 240 | 0,60 | 185 | 205 |
| DF*HV13°D2517 | 2510 | 125 | 370 | 380 | 0,37 | 255 | 255 |
| DF*HV23°D2517 | 2510 | 125 | 370 | 380 | 0,30 | 295 | 335 |
| DF*HV32°D2957 | 2950 | 175 | 295 | 305 | 0,57 | 215 | 240 |
| DF*HV42°D2957 | 2950 | 175 | 295 | 305 | 0,48 | 230 | 260 |
| DF*HV14°D3147 | 3140 | 125 | 450 | 460 | 0,34 | 255 | 255 |
| DF*HV24°D3147 | 3140 | 125 | 450 | 460 | 0,27 | 345 | 390 |
| DF*HV15°D3777 | 3770 | 125 | 530 | 540 | 0,32 | 255 | 255 |
| DF*HV25°D3777 | 3770 | 125 | 530 | 540 | 0,25 | 395 | 400 |
| DF*HV33°D3937 | 3930 | 175 | 370 | 380 | 0,49 | 255 | 255 |
| DF*HV43°D3937 | 3930 | 175 | 370 | 380 | 0,40 | 280 | 310 |
| DF*HV16°D4407 | 4400 | 125 | 610 | 620 | 0,31 | 255 | 255 |
| DF*HV26°D4407 | 4400 | 125 | 610 | 620 | 0,24 | 400 | 400 |
| DF*HV34°D4917 | 4910 | 175 | 450 | 460 | 0,44 | 255 | 255 |
| DF*HV44°D4917 | 4910 | 175 | 450 | 460 | 0,35 | 330 | 365 |
| DF*HV35°D5907 | 5900 | 175 | 530 | 540 | 0,42 | 255 | 255 |
| DF*HV45°D5907 | 5900 | 175 | 530 | 540 | 0,33 | 375 | 400 |
| DF*HV36°D6887 | 6880 | 175 | 610 | 620 | 0,40 | 255 | 255 |
| DF*HV46°D6887 | 6880 | 175 | 610 | 620 | 0,31 | 400 | 400 |

* Insert F for resin top or T for hermetic case

° Insert F for female terminals or M for male terminals

## CALCULATION FORM

## SPECIFICATION

| | | |
|---|---|---|
| **Capacitance** | C (µF) | |
| **Working voltage** | $U_w$ (V) | |
| **Rms current** | $I_{rms}$ (Arms) | |
| **Frequency** | f (Hz) | |
| **Ripple voltage** | Ur (V) | |
| **Ambient temperature** | $\theta_{amb}$ (°C) | |
| **Lifetime @ $U_w$,$I_{rms}$ and $\theta_{amb}$** | hours | |
| **Parasitic inductance** | L (nH) | |
| **Cooling conditions** | | |

**Your choice**

| | | |
|---|---|---|
| **PN** | | |
| **Capacitance** | C (µF) | |
| **Rated voltage** | $U_n$ (V) | |
| **Serial resistance** | $R_s$ (mΩ) | |
| **Thermal resistance between hot spot and case** | $R_{th1}$ (°C/W) | |
| **Thermal resistance between case and ambiant air** | $R_{th2}$ (°C/W) | |

## CALCULATIONS

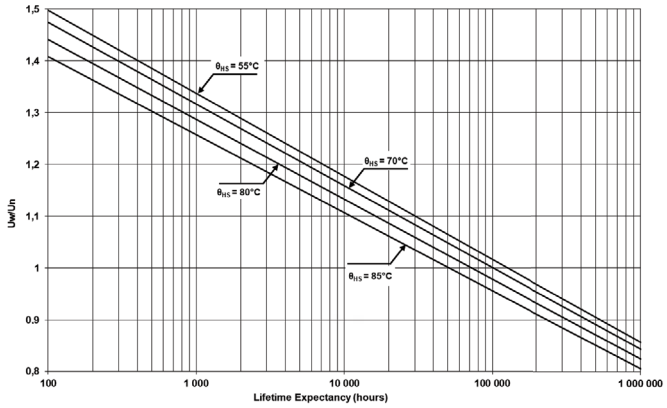
| | | | |
|---|---|---|---|
| **Maximum ripple voltage** | $U_{rmax} = 0.2\ U_n$ | $U_{rmax}$ = | V |

***The maximum ripple voltage of the selected capacitor must be in any case higher than the ripple voltage of your application***

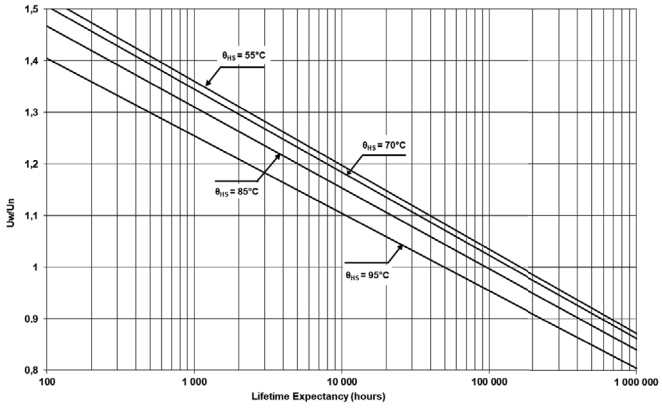
| | | | |
|---|---|---|---|
| **Ratio $U_w/U_n$** | $\rho = U_w/U_n$ | ρ = | |
| **Joule losses** | $P_j = R_s x I_{rms2}$ | $P_j$ = | W |
| **Dielectric losses** | $P_d = Q x tg\delta_0 = Q x\ 3.10^{-4}$ | $P_d$ = | W |
| **Hot spot temperature** | $\theta_{HS} = \theta_{amb} + (P_j + P_d) x R_{th}$ | $\theta_{HS}$ = | °C |

***The hot spot temperature must be in any case lower than 85°C for FFHV and 95°C for FTHV***

## FFHV LIFETIME EXPECTANCY




## FTHV LIFETIME EXPECTANCY




| | |
|---|---|
| **Expected lifetime at hot spot calculated and U = $U_w$** | |