# Reactors – Antiresonance Harmonic Filter

## General

The increasing use of modern power electronic apparatus (drives, uninterruptible power supplies, etc) produces nonlinear current and thus influences and loads the network with harmonics (line pollution).

The power factor correction or capacitance of the power capacitor forms a resonant circuit in conjunction with the feeding transformer. Experience shows that the self-resonant frequency of this circuit is typically between 250 and 500 Hz, i.e. in the region of the 5th and 7th harmonics.

Such a resonance although can lead to the following undesirable effects:
– overloading of capacitors,
– overloading of transformers and transmission equipment,
– interference with metering and control systems, computers and electrical gear,
– resonance elevation, i.e. amplification of harmonics,
– voltage distortion.

These resonance phenomena can be avoided by connecting capacitors in series with filter reactors in the PFC system. These so called "detuned" PFC systems are scaled in a way that the self-resonant frequency is below the lowest line harmonic. The detuned PFC system is purely inductive seen by harmonics above this frequency. For the base line frequency (50 or 60 Hz usually), the detuned system on the other hand acts purely capacitive, thus correcting the reactive power.

## Applications

- Avoidance of resonance conditions
- Tuned and detuned harmonic filters
- Reduction of harmonic distortion (network clearing)
- Reduction of power losses

## Features

- High harmonic loading capability
- Very low losses
- High linearity to avoid choke tilt
- Low noise
- Convenient mounting
- Long expected life time
- Temperature protection (NC contact)

| Technical data and limit values | |
|---|---|
| **Filter reactors** | |
| **Harmonics*** | $V_3$ = 0.5% $V_R$ (duty cycle = 100%)<br>$V_5$ = 6.0% $V_R$ (duty cycle = 100%)<br>$V_7$ = 5.0% $V_R$ (duty cycle = 100%)<br>$V_{11}$ = 3.5% $V_R$ (duty cycle = 100%)<br>$V_{13}$ = 3.0% $V_R$ (duty cycle = 100%) |
| **Effective current** | $I_{rms} = \sqrt{(I_1^2+I_3^2 \ldots I_{13}^2)}$ |
| **Fundamental current** | $I_1 = 1.06 \cdot I_R$ (50 Hz or 60 Hz current of capacitor) |
| **Temperature protection** | microswitch (NC) |
| **Dimensional drawings and terminals** | see specific datasheets |
| **Three-phase filter reactors to VDE 0532 / EN 60289** | |
| **Frequency** | 50 Hz or 60 Hz |
| **Voltage** | 400, 440 |
| **Output** | 10 … 100 kvar |
| **Detuning** | 5.67%, 7%, 14% |
| **Cooling** | natural |
| **Ambient temperature** | +40 °C |
| **Class of protection** | I |
| **Enclosure** | IP00 |

* According to DIN ENV VV61000-2-2


Please read *Important notes* on page 12 and *Cautions* on page 123–127

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## Characteristics

| Power<br>kvar | Δ capacitance<br>3 · µF | Inductance<br>mH | $I_{rms}$ ($I_{eff}$)<br>A | Losses[1)]<br>W | Weight<br>kg | Terminal | Ordering code |
|---|---|---|---|---|---|---|---|
| **Rated voltage V = 400 V, f = 50 Hz, p = 5.67% ($f_r$ = 210 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 2.08 · I1** | | | | | | | |
| 10 | 62 | 3.06 | 18.5 | 95 | 6.4 | 10 mm² Kl. | B44066D5010*400 |
| 12.5 | 78 | 2.45 | 23.0 | 120 | 8.4 | 10 mm² Kl. | B44066D5012*400 |
| 20 | 125 | 1.53 | 36.9 | 100 | 13 | 16 mm² Kl. | B44066D5020*400 |
| 25 | 156 | 1.23 | 46.1 | 135 | 17 | 16 mm² Kl. | B44066D5025*400 |
| 40 | 250 | 0.77 | 73.7 | 150 | 23 | M6 Al-flat | B44066D5040*400 |
| 50 | 312 | 0.61 | 92.1 | 240 | 31 | M6 Al-flat | B44066D5050*400 |
| 75 | 496 | 0.41 | 138.2 | 260 | 35 | M8 Al-flat | B44066D5075*400 |
| 100 | 625 | 0.31 | 183.8 | 360 | 47 | M8 Al-flat | B44066D5100*400 |
| **Rated voltage V = 400 V, f = 50 Hz, p = 7% ($f_r$ = 189 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 1.73 · I1** | | | | | | | |
| 10 | 61 | 3.84 | 16.4 | 70 | 5.9 | 10 mm² Kl. | B44066D7010*400 |
| 12.5 | 77 | 3.01 | 20.5 | 75 | 8.6 | 10 mm² Kl. | B44066D7012*400 |
| 20 | 123 | 1.92 | 32.7 | 120 | 18 | Cu bars Ø 9 mm | B44066D7020*400 |
| 25 | 154 | 1.53 | 40.9 | 180 | 18 | Cu bars Ø 9 mm | B44066D7025*400 |
| 40 | 246 | 0.96 | 65.4 | 230 | 26 | Cu bars Ø 9 mm | B44066D7040*400 |
| 50 | 308 | 0.77 | 81.8 | 270 | 27 | Cu bars Ø 9 mm | B44066D7050*400 |
| 75 | 462 | 0.51 | 122.7 | 330 | 39 | Cu bars Ø 9 mm | B44066D7075*400 |
| 100 | 617 | 0.38 | 163.3 | 390 | 50 | Cu bars Ø 11 mm | B44066D7100*400 |
| **Rated voltage V = 400 V, f = 50 Hz, p = 14% ($f_r$ = 135 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 1.37 · I1** | | | | | | | |
| 10 | 57 | 8.29 | 15.4 | 80 | 9.4 | 10 mm² Kl. | B44066D1410*400 |
| 12.5 | 71 | 6.64 | 19.2 | 95 | 12 | 10 mm² Kl. | B44066D1412*400 |
| 20 | 114 | 4.15 | 30.8 | 150 | 22 | Cu bars Ø 9 mm | B44066D1420*400 |
| 25 | 142 | 3.32 | 38.5 | 200 | 26 | Cu bars Ø 9 mm | B44066D1425*400 |
| 40 | 228 | 2.07 | 61.6 | 270 | 38 | Cu bars Ø 9 mm | B44066D1440*400 |
| 50 | 285 | 1.66 | 77 | 290 | 40 | Cu bars Ø 9 mm | B44066D1450*400 |
| 75 | 427 | 1.11 | 115.5 | 380 | 58 | Cu bars Ø 9 mm | B44066D1475*400 |
| 100 | 570 | 0.83 | 153.9 | 470 | 66 | Cu bars Ø 11 mm | B44066D1499*400 |
| **Rated voltage V = 440 V, f = 50 Hz, p = 5.67% ($f_r$ = 210 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 2.08 · I1** | | | | | | | |
| 10 | 51 | 3.71 | 16.8 | 100 | 7 | 10 mm² Kl. | B44066D5010*440 |
| 12.5 | 64 | 2.97 | 21.0 | 120 | 9 | 10 mm² Kl. | B44066D5012*440 |
| 25 | 129 | 1.48 | 42.0 | 110 | 16.5 | 16 mm² Kl. | B44066D5025*440 |
| 50 | 258 | 0.74 | 83.8 | 200 | 25 | M6 Al-flat | B44066D5050*440 |
| 75 | 387 | 0.49 | 125.6 | 370 | 36 | M8 Al-flat | B44066D5075*440 |
| 100 | 517 | 0.37 | 168.0 | 320 | 50 | M8 Al-flat | B44066D5100*440 |

[1)] Total max. losses, considering max. specified overvoltage and harmonic currents

* TDK offers reactors with slightly different specifications (e.g. dimensions) that can be used for the same application although sometimes with slightly different resulting performances. These types are distinguished by different letters at digit 12 of the product code. Thus this digit is not specified here.

Other voltages upon request

# Reactors – Antiresonance Harmonic Filter

## Characteristics

| Power kvar | Δ capacitance 3 · µF | Inductance mH | $I_{rms}$ ($I_{eff}$) A | Losses[1] W | Weight kg | Terminal | Ordering code |
|---|---|---|---|---|---|---|---|
| **Rated voltage V = 440 V, f = 50 Hz, p = 7% ($f_r$ = 189 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 1.73 · I1** | | | | | | | |
| 10 | 50 | 4.64 | 14.9 | 70 | 6.5 | 10 mm² Kl. | B44066D7010*440 |
| 12.5 | 63 | 3.71 | 18.7 | 65 | 8.5 | 10 mm² Kl. | B44066D7012*440 |
| 25 | 127 | 1.87 | 37.2 | 170 | 18 | Cu bars Ø 9 mm | B44066D7025*440 |
| 50 | 254 | 0.93 | 74.3 | 250 | 33 | Cu bars Ø 9 mm | B44066D7050*440 |
| 75 | 382 | 0.62 | 111.4 | 340 | 43 | Cu bars Ø 9 mm | B44066D7075*440 |
| 100 | 509 | 0.46 | 148.7 | 410 | 49 | Cu bars Ø 9 mm | B44066D7100*440 |
| **Rated voltage V = 440 V, f = 50 Hz, p = 14% ($f_r$ = 135 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 1.37 · I1** | | | | | | | |
| 10 | 47 | 10.04 | 14.0 | 90 | 10 | 10 mm² Kl. | B44066D1410*440 |
| 12.5 | 58 | 8.03 | 17.5 | 100 | 13 | 10 mm² Kl. | B44066D1412*440 |
| 25 | 117 | 4.02 | 35.0 | 160 | 27 | Cu bars Ø 9 mm | B44066D1425*440 |
| 50 | 235 | 2.01 | 70.0 | 300 | 40 | Cu bars Ø 9 mm | B44066D1450*440 |
| 75 | 353 | 1.34 | 105.0 | 440 | 53 | Cu bars Ø 9 mm | B44066D1475*440 |
| 100 | 471 | 1.00 | 140.0 | 490 | 65 | Cu bars Ø 9 mm | B44066D1499*440 |
| **Rated voltage V = 440 V, f = 60 Hz, p = 5.67% ($f_r$ = 252 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 2.08 · I1** | | | | | | | |
| 25 | 107 | 1.24 | 42.0 | 140 | 16 | 16 mm² Kl. | B44066D5025*441 |
| 50 | 215 | 0.62 | 83.8 | 210 | 25 | M6 Al-flat | B44066D5050*441 |
| 75 | 323 | 0.41 | 126.0 | 340 | 33 | M8 Al-flat | B44066D5075*441 |
| 100 | 431 | 0.31 | 167.4 | 310 | 47 | M8 Al-flat | B44066D5100*441 |
| **Rated voltage V = 440 V, f = 60 Hz, p = 7% ($f_r$ = 227 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 1.73 · I1** | | | | | | | |
| 25 | 106 | 1.55 | 37.2 | 130 | 18 | Cu bars Ø 9 mm | B44066D7025*441 |
| 50 | 212 | 0.77 | 74.4 | 250 | 27 | Cu bars Ø 9 mm | B44066D7050*441 |
| 75 | 318 | 0.52 | 111.4 | 320 | 39 | Cu bars Ø 9 mm | B44066D7075*441 |
| 100 | 424 | 0.39 | 148.6 | 380 | 44 | Cu bars Ø 9 mm | B44066D7100*441 |
| **Rated voltage V = 440 V, f = 60 Hz, p = 14% ($f_r$ = 162 Hz) / Linearity: L ≥ 0.95 · $L_R$ for current up to 1.37 · I1** | | | | | | | |
| 25 | 98 | 3.35 | 34.8 | 180 | 22 | Cu bars Ø 9 mm | B44066D1425*441 |
| 50 | 196 | 1.67 | 69.5 | 290 | 34 | Cu bars Ø 9 mm | B44066D1450*441 |
| 75 | 294 | 1.12 | 104.3 | 380 | 45 | Cu bars Ø 9 mm | B44066D1475*441 |
| 100 | 392 | 0.84 | 139.1 | 480 | 54 | Cu bars Ø 9 mm | B44066D1499*441 |

[1] Total max. losses, considering max. specified overvoltage and harmonic currents

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