

Three phase low voltage power capacitors LPC

LPC 1..5 kVar

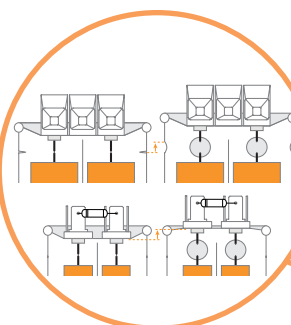


→ Equipped with discharge resistors
(Discharge time ≤ 3 minutes to 75 V)

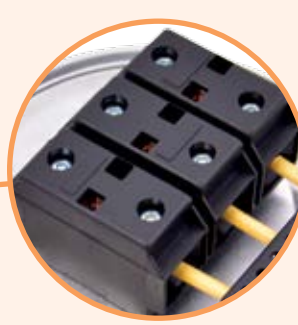
LPC 10..50 kVar



→ Capacitors 1 ... 5 kVar connected with a double FASTON connector
Included protection cover for electrical parts



→ Overpressure
disconnection system



→ 10 ... 50 kVar capacitor terminals with
universal screws
(for slot "flat" screwdriver + Allen key
"Imbus")



→ Vertical use only



→ rated power range: 1 kVar
to 50 kVar

→ Rated voltage range:
400, 440 460, 480, 525 V



→ Ground fixation with
thread, for vertical use only.

Three Phase Capacitors

Rated voltage: 400-525V, 50Hz (60Hz upon request)

Rated power: 1-50kVAR

APPLICATION

The LPC capacitors are used for reactive power factor correction of inductive consumers (transformers, electric motors, rectifiers, fluorescent lamps and many others in industrial networks) individually or assembled into automatic capacitor banks.

DESCRIPTION

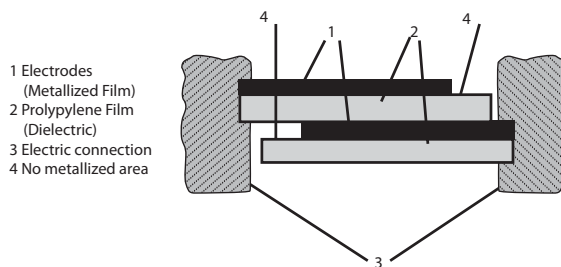
LPC capacitors are manufactured with low loss metallized self-healing polypropylene film. Dry type capacitors are filled with a non-toxic an ecological polyurethane resin, this resin provides an excellent heat dissipation properties. This capacitors are mounted in aluminium housing with overpressure disconnection system. Two types of connectors, faston connector for capacitors with rated power up to 5kVAR, for higher values above 5kVAR screw terminal type.

FEATURES:

Self healing

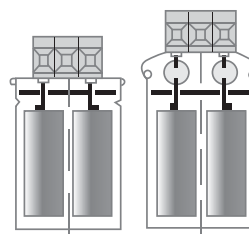
Depending on the values of the constants of every dielectric, there is a limit potential difference, which all materials can manage throughout the thickness. This limit is defined as dielectric strength. Because of determined electric-power system conditions or extreme temperatures, inadmissible for the correct working of the capacitor, this voltage limit can be exceeded. Thus, the dielectric can break down and an electric arc will be formed between the plates.

The propylene film self-healing means that the electric arc will not generate a short circuit, but will evaporate the metal which surrounds the breakthrough point. This way, the isolation between plates is repaired in the latter breakthrough point. After this self-healing, the capacitor can work in normal conditions, with a capacitance leak inferior to 100 pF.



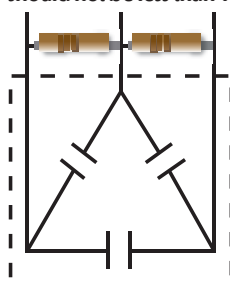
Overpressure disconnection system

In order to avoid problems caused by overvoltage, harmonics, high temperatures, etc. capacitors have been designed with an overpressure disconnection system. When the terminal cover expands, the internal connections are interrupted and disconnecting the capacitor.



Discharge resistor

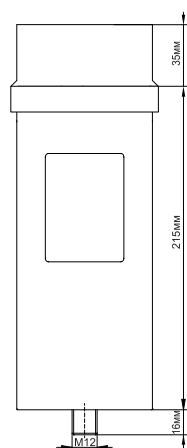
When handling a capacitor, there is a need of taking into account a series of security precautions. When a capacitor is disconnected off the voltage, it remains charged with the supply voltage. If the plates are shorten and touched, they can cause a dangerous accident due to the violent discharge of the capacitor. Three-phase capacitors must also be equipped with a discharge resistor, which can discharge voltage until its maximum value is 75V in an interval of 3 minutes as demanded by standard EN-60831-1/2. ETI's LPC capacitors already have discharge resistors, which ensure that this time is less than 2 minutes. It is therefore recommended that the reconnection time on the PFC controller should not be less than 120s. Except in case of using extra discharge resistors (page 293).



$$U_{(t)} = U_o e^{-\frac{t}{RC}}$$

Three phase low voltage power capacitors LPC

| Rated voltage at 50Hz | Code No. | Type | Rated Power [kVAr] | Rated capacitance [uF] | Rated current [A] | D (diameter) x H (Height) [mm] | Terminal type | Weight [kg] | Packaging [pcs] |
|-----------------------|-----------|--------------------------|--------------------|------------------------|-------------------|--------------------------------|---------------|-------------|-----------------|
| 400 | 004656700 | LPC 1 kVAr, 400V, 50Hz | 1 | 3x 6,6 | 1,4 | 60x200 | Faston | 0,75 | 1 |
| 400 | 004656701 | LPC 1.5 kVAr, 400V, 50Hz | 1,5 | 3x 9,9 | 2,2 | 60x200 | Faston | 0,75 | 1 |
| 400 | 004656702 | LPC 2.5 kVAr, 400V, 50Hz | 2,5 | 3x 16,6 | 3,6 | 60x210 | Faston | 0,75 | 1 |
| 400 | 004656703 | LPC 3 kVAr, 400V, 50Hz | 3 | 3x 19,9 | 4,3 | 60x210 | Faston | 0,75 | 1 |
| 400 | 004656704 | LPC 4 kVAr, 400V, 50Hz | 4 | 3x 26,5 | 5,8 | 60x210 | Faston | 0,75 | 1 |
| 400 | 004656705 | LPC 5 kVAr, 400V, 50Hz | 5 | 3x 33,2 | 7,2 | 60x210 | Faston | 0,75 | 1 |
| 440 | 004656710 | LPC 2.5 kVAr, 440V, 50Hz | 2,5 | 3x 13,7 | 3,3 | 60x210 | Faston | 0,75 | 1 |
| 440 | 004656711 | LPC 3 kVAr, 440V, 50Hz | 3 | 3x 16,4 | 3,9 | 60x210 | Faston | 0,75 | 1 |
| 440 | 004656712 | LPC 4 kVAr, 440V, 50Hz | 4 | 3x 21,9 | 5,2 | 60x210 | Faston | 0,75 | 1 |
| 440 | 004656713 | LPC 5 kVAr, 440V, 50Hz | 5 | 3x 27,4 | 6,6 | 60x210 | Faston | 0,75 | 1 |
| 460 | 004656720 | LPC 2.5 kVAr, 460V, 50Hz | 2,5 | 3x 12,5 | 3,1 | 60x210 | Faston | 0,75 | 1 |
| 460 | 004656721 | LPC 3 kVAr, 460V, 50Hz | 3 | 3x 15,0 | 3,8 | 60x210 | Faston | 0,75 | 1 |
| 460 | 004656722 | LPC 4 kVAr, 460V, 50Hz | 4 | 3x 20,1 | 5,0 | 60x210 | Faston | 0,75 | 1 |
| 460 | 004656723 | LPC 5 kVAr, 460V, 50Hz | 5 | 3x 25,1 | 6,3 | 60x210 | Faston | 0,75 | 1 |
| 480 | 004656730 | LPC 2.5 kVAr, 480V, 50Hz | 2,5 | 3x 11,5 | 3,0 | 60x210 | Faston | 0,75 | 1 |
| 480 | 004656731 | LPC 3 kVAr, 480V, 50Hz | 3 | 3x 13,8 | 3,6 | 60x210 | Faston | 0,75 | 1 |
| 480 | 004656732 | LPC 4 kVAr, 480V, 50Hz | 4 | 3x 18,4 | 4,8 | 60x210 | Faston | 0,75 | 1 |
| 480 | 004656733 | LPC 5 kVAr, 480V, 50Hz | 5 | 3x 23,0 | 6,0 | 60x210 | Faston | 0,75 | 1 |
| 525 | 004656740 | LPC 2.5 kVAr, 525V, 50Hz | 2,5 | 3x 9,6 | 2,7 | 60x210 | Faston | 0,75 | 1 |
| 525 | 004656741 | LPC 3 kVAr, 525V, 50Hz | 3 | 3x 11,5 | 3,3 | 60x210 | Faston | 0,75 | 1 |
| 525 | 004656742 | LPC 4 kVAr, 525V, 50Hz | 4 | 3x 15,4 | 4,4 | 60x210 | Faston | 0,75 | 1 |
| 525 | 004656743 | LPC 5 kVAr, 525V, 50Hz | 5 | 3x 19,2 | 5,5 | 60x210 | Faston | 0,75 | 1 |



1-5kVAr

| Dimensions D x H (mm) | Terminal ø |
|--------------------------|---------------|
| 60 x 200 | FAD 6,3 |
| Conductor type | 1 kV-RV |

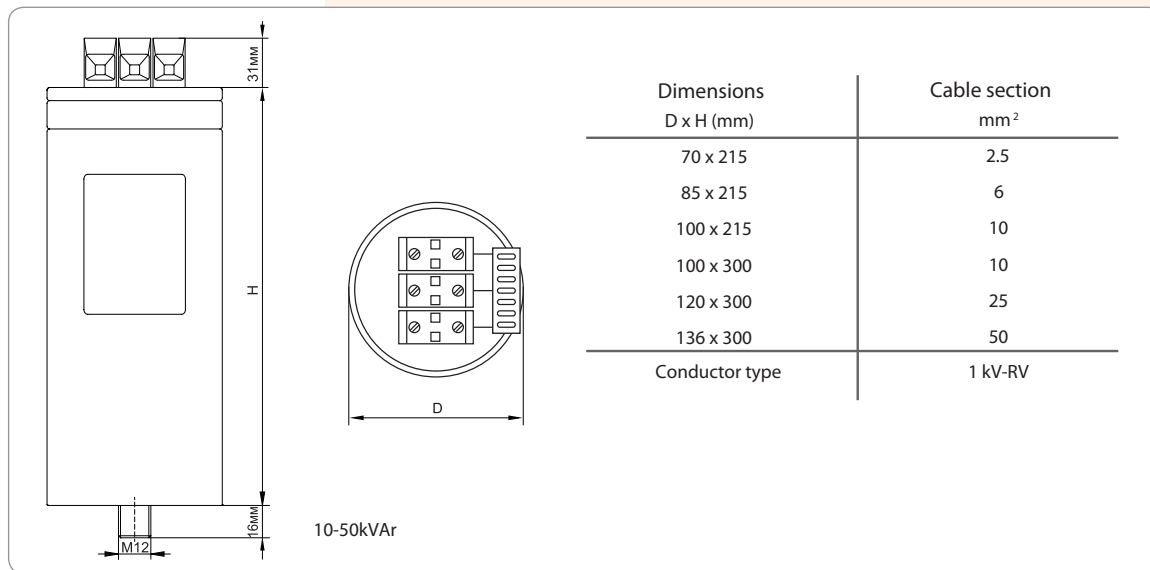


Three Phase Capacitors

Three phase low voltage power capacitors LPC

| Rated voltage at 50Hz | Code No. | Type | Rated Power [kVar] | Rated capacitance [uF] | Rated current [A] | D (diameter) x H (Height) [mm] | Terminal type | Weight [kg] | Packaging [pcs] |
|-----------------------|-----------|---------------------------|-----------------------|---------------------------|----------------------|--------------------------------------|----------------|----------------|--------------------|
| 400 | 004656750 | LPC 10 kVar, 400V, 50HZ | 10 | 3x 66,3 | 14,4 | 85x225 | Screw terminal | 1,6 | 1 |
| 400 | 004656751 | LPC 12.5 kVar, 400V, 50HZ | 12,5 | 3x 82,9 | 18,0 | 100x225 | Screw terminal | 2,2 | 1 |
| 400 | 004656752 | LPC 15 kVar, 400V, 50HZ | 15 | 3x 99,5 | 21,7 | 100x225 | Screw terminal | 2,2 | 1 |
| 400 | 004656753 | LPC 20 kVar, 400V, 50HZ | 20 | 3x 132,6 | 28,9 | 100x225 | Screw terminal | 2,2 | 1 |
| 400 | 004656754 | LPC 25 kVar, 400V, 50HZ | 25 | 3x 165,8 | 36,1 | 120x310 | Screw terminal | 2,9 | 1 |
| 400 | 004656755 | LPC 30 kVar, 400V, 50HZ | 30 | 3x 198,9 | 43,3 | 120x310 | Screw terminal | 3,9 | 1 |
| 400 | 004656756 | LPC 40 kVar, 400V, 50HZ | 40 | 3x 265,3 | 57,7 | 136x310 | Screw terminal | 5,1 | 1 |
| 400 | 004656757 | LPC 50 kVar, 400V, 50HZ | 50 | 3x 331,6 | 72,2 | 136x310 | Screw terminal | 5,1 | 1 |
| 440 | 004656760 | LPC 10 kVar, 440V, 50HZ | 10 | 3x 54,8 | 13,1 | 85x225 | Screw terminal | 1,6 | 1 |
| 440 | 004656761 | LPC 12.5 kVar, 440V, 50HZ | 12,5 | 3x 68,5 | 16,4 | 100x225 | Screw terminal | 2,2 | 1 |
| 440 | 004656762 | LPC 15 kVar, 440V, 50HZ | 15 | 3x 82,2 | 19,7 | 100x225 | Screw terminal | 2,2 | 1 |
| 440 | 004656763 | LPC 20 kVar, 440V, 50HZ | 20 | 3x 109,6 | 26,2 | 100x310 | Screw terminal | 2,9 | 1 |
| 440 | 004656764 | LPC 25 kVar, 440V, 50HZ | 25 | 3x 137,0 | 32,8 | 100x310 | Screw terminal | 2,9 | 1 |
| 440 | 004656765 | LPC 30 kVar, 440V, 50HZ | 30 | 3x 164,4 | 39,4 | 120x310 | Screw terminal | 3,9 | 1 |
| 440 | 004656766 | LPC 40 kVar, 440V, 50HZ | 40 | 3x 219,2 | 52,5 | 136x310 | Screw terminal | 5,1 | 1 |
| 440 | 004656767 | LPC 50 kVar, 440V, 50HZ | 50 | 3x 274,0 | 65,6 | 136x310 | Screw terminal | 5,1 | 1 |
| 460 | 004656770 | LPC 10 kVar, 460V, 50HZ | 10 | 3x 50,1 | 12,6 | 85x225 | Screw terminal | 1,6 | 1 |
| 460 | 004656771 | LPC 12.5 kVar, 460V, 50HZ | 12,5 | 3x 62,7 | 15,7 | 100x225 | Screw terminal | 2,2 | 1 |
| 460 | 004656772 | LPC 15 kVar, 460V, 50HZ | 15 | 3x 75,2 | 18,8 | 100x225 | Screw terminal | 2,2 | 1 |
| 460 | 004656773 | LPC 20 kVar, 460V, 50HZ | 20 | 3x 100,3 | 25,1 | 100x310 | Screw terminal | 2,9 | 1 |
| 460 | 004656774 | LPC 25 kVar, 460V, 50HZ | 25 | 3x 125,4 | 31,4 | 100x310 | Screw terminal | 2,9 | 1 |
| 460 | 004656775 | LPC 30 kVar, 460V, 50HZ | 30 | 3x 150,4 | 37,7 | 120x310 | Screw terminal | 3,9 | 1 |
| 460 | 004656776 | LPC 30.8 kVar, 460V, 50HZ | 30,8 | 3x 154,4 | 38,7 | 120x310 | Screw terminal | 3,9 | 1 |
| 460 | 004656777 | LPC 40 kVar, 460V, 50HZ | 40 | 3x 200,6 | 50,2 | 136x310 | Screw terminal | 5,1 | 1 |
| 460 | 004656778 | LPC 50 kVar, 460V, 50HZ | 50 | 3x 250,7 | 62,8 | 136x310 | Screw terminal | 5,1 | 1 |
| 480 | 004656780 | LPC 10 kVar, 480V, 50HZ | 10 | 3x 46,1 | 12,0 | 85x225 | Screw terminal | 1,6 | 1 |
| 480 | 004656781 | LPC 12.5kVar, 480V, 50HZ | 12,5 | 3x 57,6 | 15,0 | 100x225 | Screw terminal | 2,2 | 1 |
| 480 | 004656782 | LPC 15 kVar, 480V, 50HZ | 15 | 3x 69,1 | 18,0 | 100x225 | Screw terminal | 2,2 | 1 |
| 480 | 004656783 | LPC 20 kVar, 480V, 50HZ | 20 | 3x 92,1 | 24,1 | 100x310 | Screw terminal | 2,9 | 1 |
| 480 | 004656784 | LPC 25 kVar, 480V, 50HZ | 25 | 3x 115,1 | 30,1 | 120x310 | Screw terminal | 3,9 | 1 |
| 480 | 004656785 | LPC 30 kVar, 480V, 50HZ | 30 | 3x 138,2 | 36,1 | 120x310 | Screw terminal | 3,9 | 1 |
| 480 | 004656786 | LPC 40 kVar, 480V, 50HZ | 40 | 3x 184,2 | 48,1 | 136x310 | Screw terminal | 5,1 | 1 |
| 480 | 004656787 | LPC 50 kVar, 480V, 50HZ | 50 | 3x 230,3 | 60,1 | 136x310 | Screw terminal | 5,1 | 1 |
| 525 | 004656790 | LPC 10 kVar, 525V, 50HZ | 10 | 3x 38,5 | 11,0 | 85x225 | Screw terminal | 1,6 | 1 |
| 525 | 004656791 | LPC 12.5kVar, 525V, 50HZ | 12,5 | 3x 48,1 | 13,7 | 100x225 | Screw terminal | 2,2 | 1 |
| 525 | 004656792 | LPC 15 kVar, 525V, 50HZ | 15 | 3x 57,7 | 16,5 | 100x225 | Screw terminal | 2,2 | 1 |
| 525 | 004656793 | LPC 20 kVar, 525V, 50HZ | 20 | 3x 77,0 | 22,0 | 100x310 | Screw terminal | 2,9 | 1 |
| 525 | 004656794 | LPC 25 kVar, 525V, 50HZ | 25 | 3x 96,2 | 27,5 | 100x310 | Screw terminal | 2,9 | 1 |
| 525 | 004656795 | LPC 30 kVar, 525V, 50HZ | 30 | 3x 115,5 | 33,0 | 120x310 | Screw terminal | 3,9 | 1 |
| 525 | 004656796 | LPC 40 kVar, 525V, 50HZ | 40 | 3x 154,0 | 44,0 | 136x310 | Screw terminal | 5,1 | 1 |
| 525 | 004656797 | LPC 50 kVar, 525V, 50HZ | 50 | 3x 192,5 | 55,0 | 136x310 | Screw terminal | 5,1 | 1 |



**Technical data**

| | |
|--------------------------------|--|
| Standards | IEC 60831-1/2 EN 60831-1/2 |
| Capacitance tolerance | -5% +10% |
| Frequency | 50Hz (60Hz upon request) |
| Temperature range | -25°C ... +55°C* |
| Dielectric losses | ≤0.2 W/kVar |
| Total losses | ≤0.45 W/kVar |
| Maximum over voltage | 1,1 x Un |
| Maximum over current | 1,5 x In |
| Max. THD in voltage | 2% |
| Max. THD in current | 25% |
| Discharge resistance | Incorporated; ≤ 2 min to 75V |
| Connection | Delta |
| Casing | Aluminium case |
| Disconnection system | Overpressure |
| Dielectric | Metalized polypropylene film, self-healing |
| Voltage test between terminals | 2,15 x In 2 sec. |
| Voltage test terminals to case | 3KV for 10 second. AC |
| Terminal type | Connector |
| Inrush current | 200 x In |
| Protection | IP 20, indoor mounting |
| Humidity | Max 95% |
| Expected | 120.000 Hrs. (Temp. level C) |
| Altitude | Max. 2000 above sea level |
| Screw terminal | ≤ 20 kVar 100Ncm |
| Tightening torque | ≥ 25kVar 250Ncm |

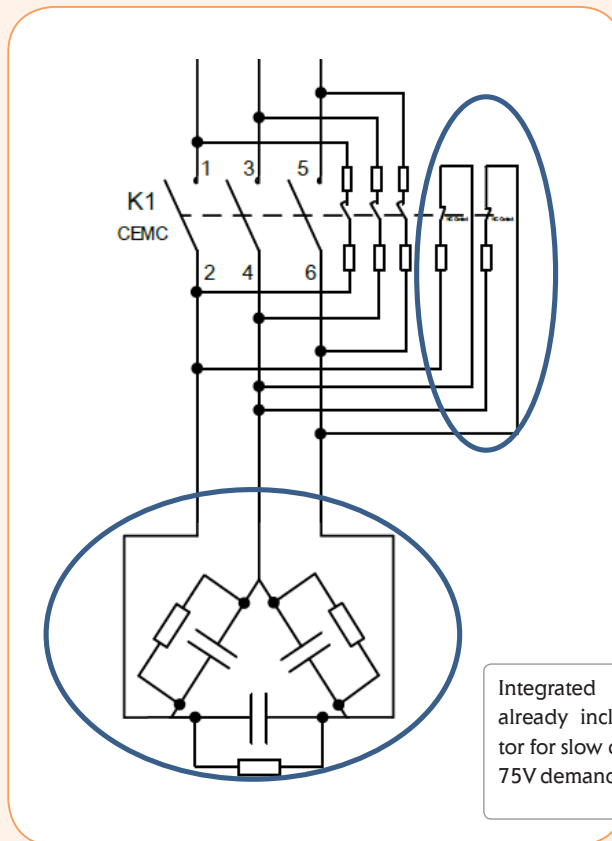
*Special declaration for lower temperature (-40°C) available on request

Extra discharge resistors for fast and secure discharge of capacitors

Set of 2 extra discharge resistors for fast and secure discharge of capacitors

| Type | Code No. | Resistance [ohm] | Power [W] | Weight [g] | Packaging [pcs] |
|------------------|-----------|------------------|-----------|------------|-----------------|
| LPC EDR 1K8, 10W | 004656798 | 1K8 | 10 | 30 | 200 |

To connect extra discharge resistors, 2 auxiliary contacts NC on capacitor duty contactor must be used



Extra discharge resistors 1K8 10W with auxiliary NC contacts (capacitor empty in less then 5s)

Integrated discharge resistors already included with capacitor for slow discharge ($\leq 2\text{min}$ to 75V demand by IEC 60831 - 1 / 2)



Individual Power Factor Correction for Low Voltage Motors

| Rated motor power [kW] | Power rating of capacitor in (kvar) with respect to motor power, speed of rotation and load | | | | | | | | | |
|------------------------|---|------------------|---------------|------------------|---------------|------------------|---------------|------------------|---------------|------------------|
| | 3000 r / min | | 1500 r/min | | 1000 r/min | | 750 r/min | | 500 r/min | |
| | No load(kVAr) | Full load (kVAr) | No load(kVAr) | Full load (kVAr) | No load(kVAr) | Full load (kVAr) | No load(kVAr) | Full load (kVAr) | No load(kVAr) | Full load (kVAr) |
| 5,5 | 2,2 | 2,9 | 2,4 | 3,3 | 2,7 | 3,6 | 3,2 | 4,3 | 4 | 5,2 |
| 7,5 | 3,4 | 4,4 | 3,6 | 4,8 | 4,1 | 5,4 | 4,6 | 6,1 | 5,5 | 7,2 |
| 11 | 5 | 6,5 | 5,5 | 7,2 | 6 | 8 | 7 | 9 | 7,5 | 10 |
| 15 | 6,5 | 8,5 | 7 | 9,5 | 8 | 10 | 9 | 12 | 10 | 13 |
| 18,5 | 8 | 11 | 9 | 12 | 10 | 13 | 11 | 15 | 12 | 16 |
| 22 | 10 | 12,5 | 11 | 13,5 | 12 | 15 | 13 | 16 | 15 | 19 |
| 30 | 14 | 18 | 15 | 20 | 17 | 22 | 22 | 25 | 22 | 28 |
| 37 | 18 | 24 | 20 | 27 | 22 | 30 | 26 | 34 | 29 | 39 |
| 45 | 19 | 28 | 21 | 31 | 24 | 34 | 28 | 38 | 31 | 43 |
| 55 | 22 | 34 | 25 | 37 | 28 | 41 | 32 | 46 | 36 | 52 |
| 75 | 28 | 45 | 32 | 49 | 37 | 54 | 41 | 60 | 45 | 68 |
| 90 | 34 | 54 | 39 | 59 | 44 | 65 | 49 | 72 | 54 | 83 |
| 110 | 40 | 64 | 46 | 70 | 52 | 76 | 58 | 85 | 63 | 98 |
| 132 | 45 | 72 | 53 | 80 | 60 | 87 | 67 | 97 | 75 | 110 |
| 160 | 54 | 86 | 64 | 96 | 72 | 103 | 81 | 116 | 91 | 132 |
| 200 | 66 | 103 | 77 | 115 | 87 | 125 | 97 | 140 | 110 | 160 |
| 250 | 75 | 115 | 85 | 125 | 95 | 137 | 105 | 150 | 120 | 175 |

It is useful to compensate rarely switched low voltage motors with a fixed connected capacitor due to technical and cost reasons.

Description - The required capacitor power is calculated with the following formula:

$$Q_n = 0,9 \cdot U_n \cdot I_{mag} \cdot \sqrt{3}$$

where:

Q_n - capacitor power (VAr)

U_n - rated voltage (V)

I_{mag} - motor magnetising current (A)

Quick discharging with a bigger capacitor can cause self-excitation. If quick discharging of the motor is not possible, the motor can compensate itself according to the actual consumption of reactive power.

Capacitor power versus working voltage

Capacitor working power depends on working voltage

$$(U_e / U_n)^2 \cdot Q_c = Q_f$$

where:

U_e - mains voltage;

U_n - capacitor rated voltage

Q_c - capacitor power at rated voltage

Q_f - capacitor actual power

| Rated voltage | Rated capacity (μF) | Rated Power (kVAr) at $U_n = 380$ V | Rated Power (kVAr) at $U_n = 400$ V | Rated Power (kVAr) at $U_n = 420$ V | Rated Power(kVAr) at $U_n = 440$ V |
|----------------|---------------------|-------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|
| 400 V 50 Hz | 3 x 16,6 | 2,3 | 2,5 | - | - |
| | 3 x 19,9 | 2,7 | 3 | - | - |
| | 3 x 26,5 | 3,6 | 4 | - | - |
| | 3 x 33,2 | 4,5 | 5 | - | - |
| | 3 x 66,3 | 9,0 | 10 | - | - |
| | 3 x 83,3 | 11,3 | 12,5 | - | - |
| | 3 x 100 | 13,6 | 15 | - | - |
| | 3 x 133,0 | 18,1 | 20 | - | - |
| | 3 x 165,8 | 22,6 | 25 | - | - |
| | 3 x 198,9 | 27,1 | 30 | - | - |
| 440 V 50 Hz | 3 x 13,7 | 1,9 | 2,1 | 2,3 | 2,5 |
| | 3 x 16,5 | 2,2 | 2,5 | 2,7 | 3 |
| | 3 x 21,9 | 3,0 | 3,3 | 3,6 | 4 |
| | 3 x 27,4 | 3,7 | 4,1 | 4,6 | 5 |
| | 3 x 54,9 | 7,5 | 8,3 | 9,1 | 10 |
| | 3 x 68,6 | 9,3 | 10,3 | 11,4 | 12,5 |
| | 3 x 82,3 | 11,2 | 12,4 | 13,7 | 15 |
| | 3 x 110,0 | 14,9 | 16,5 | 18,2 | 20 |
| | 3 x 137,1 | 18,6 | 20,7 | 22,8 | 25 |
| | 3 x 164,4 | 22,4 | 24,8 | 27,3 | 30 |

Three Phase Capacitors

Table definition of reactive power capacitor bank (kVAr), necessary to achieve a desired $\cos \varphi$

The value of factor K read from table should be multiplied with the value of active power to determine kVAr required for power factor correction.

Capacitive reactive power is calculated by formula:

$$Q_c = P \cdot K$$

P – real power of the load

$\cos \varphi_0$ – $\cos \varphi$ the system without power factor correction

$\cos \varphi_1$ – required $\cos \varphi$ achieved with power factor correction

Q_c – reactive power of compensation system

K – factor read from table defined by $\cos \varphi_0$ and $\cos \varphi_1$ (see table below)

| Existing power factor $\cos \varphi_0$ | Required power factor $\cos \varphi_1$ | | | | | | | | | | | | |
|---|--|------|------|------|------|------|------|------|------|------|------|------|------|
| | 0,7 | 0,75 | 0,8 | 0,82 | 0,84 | 0,86 | 0,88 | 0,9 | 0,92 | 0,94 | 0,96 | 0,98 | 1,00 |
| 0,5 | 0,71 | 0,85 | 0,98 | 1,03 | 1,09 | 1,14 | 1,19 | 1,25 | 1,31 | 1,37 | 1,44 | 1,53 | 1,73 |
| 0,52 | 0,62 | 0,76 | 0,89 | 0,94 | 1 | 1,05 | 1,1 | 1,16 | 1,22 | 1,28 | 1,35 | 1,44 | 1,64 |
| 0,54 | 0,54 | 0,68 | 0,81 | 0,86 | 0,91 | 0,97 | 1,02 | 1,07 | 1,13 | 1,2 | 1,27 | 1,36 | 1,56 |
| 0,56 | 0,46 | 0,6 | 0,73 | 0,78 | 0,83 | 0,89 | 0,94 | 1 | 1,05 | 1,12 | 1,19 | 1,28 | 1,48 |
| 0,58 | 0,38 | 0,52 | 0,65 | 0,71 | 0,76 | 0,81 | 0,86 | 0,92 | 0,98 | 1,04 | 1,11 | 1,2 | 1,4 |
| 0,6 | 0,31 | 0,45 | 0,58 | 0,64 | 0,69 | 0,74 | 0,79 | 0,85 | 0,91 | 0,97 | 1,04 | 1,13 | 1,33 |
| 0,62 | 0,25 | 0,38 | 0,52 | 0,57 | 0,62 | 0,67 | 0,73 | 0,78 | 0,84 | 0,9 | 0,97 | 1,06 | 1,27 |
| 0,64 | 0,18 | 0,32 | 0,45 | 0,5 | 0,55 | 0,61 | 0,66 | 0,72 | 0,77 | 0,84 | 0,91 | 1 | 1,2 |
| 0,66 | 0,12 | 0,26 | 0,39 | 0,44 | 0,49 | 0,54 | 0,6 | 0,65 | 0,71 | 0,78 | 0,85 | 0,94 | 1,14 |
| 0,68 | 0,06 | 0,2 | 0,33 | 0,38 | 0,43 | 0,48 | 0,54 | 0,59 | 0,65 | 0,72 | 0,79 | 0,88 | 1,08 |
| 0,7 | | 0,14 | 0,27 | 0,32 | 0,37 | 0,43 | 0,48 | 0,54 | 0,59 | 0,66 | 0,73 | 0,82 | 1,02 |
| 0,72 | | 0,08 | 0,21 | 0,27 | 0,32 | 0,37 | 0,42 | 0,48 | 0,54 | 0,6 | 0,67 | 0,76 | 0,96 |
| 0,74 | | 0,03 | 0,16 | 0,21 | 0,26 | 0,32 | 0,37 | 0,42 | 0,48 | 0,55 | 0,62 | 0,71 | 0,91 |
| 0,76 | | | 0,11 | 0,16 | 0,21 | 0,26 | 0,32 | 0,37 | 0,43 | 0,49 | 0,56 | 0,65 | 0,86 |
| 0,78 | | | 0,05 | 0,1 | 0,16 | 0,21 | 0,26 | 0,32 | 0,38 | 0,44 | 0,51 | 0,6 | 0,8 |
| 0,8 | | | | 0,05 | 0,1 | 0,16 | 0,21 | 0,27 | 0,32 | 0,39 | 0,46 | 0,55 | 0,75 |
| 0,82 | | | | | 0,05 | 0,1 | 0,16 | 0,21 | 0,27 | 0,34 | 0,41 | 0,49 | 0,7 |
| 0,84 | | | | | | 0,05 | 0,11 | 0,16 | 0,22 | 0,28 | 0,35 | 0,44 | 0,65 |
| 0,86 | | | | | | | 0,05 | 0,11 | 0,17 | 0,23 | 0,3 | 0,39 | 0,59 |
| 0,88 | | | | | | | | 0,06 | 0,11 | 0,18 | 0,25 | 0,34 | 0,54 |
| 0,9 | | | | | | | | | 0,06 | 0,12 | 0,19 | 0,28 | 0,48 |
| 0,92 | | | | | | | | | | 0,06 | 0,13 | 0,22 | 0,43 |
| 0,94 | | | | | | | | | | | 0,07 | 0,16 | 0,36 |

Calculations

Three-phase capacitor power:

$$Q_c = C \cdot 3 \cdot V^2 \cdot 2 \cdot \pi \cdot f_n$$

Example: $3 \times 331.5 \mu\text{F}$ at 400V/50Hz

$$0.0003315 \cdot 3 \cdot 400^2 \cdot 314.16 = 50 \text{ kVAr}$$

The resonant frequency (f_r) and filtering factor (p) in systems with compensation filters:

$$f_r = f_n \cdot \sqrt{\frac{1}{p}} \quad \text{or} \quad p = \left(\frac{f_n}{f_r} \right)^2$$

Example: for $p = 0.07$ at 50 Hz; $f_r = 189 \text{ Hz}$

The calculation of the power factor $\cos \varphi$:

$$\cos \varphi = \frac{P}{S} \quad \text{or} \quad \cos \varphi = \frac{1}{\sqrt{1 + \tan^2 \varphi}} \quad \text{or} \quad \cos \varphi = \frac{1}{\sqrt{1 + \left(\frac{Q}{P} \right)^2}}$$

Fuse selection (gG):

$$I_n = 1,6 \cdot I$$

For $U_{\text{main}} = 400\text{V}$, $U_n = \text{min. } 690\text{V}$

Three-phase capacitor power with detuning reactor in series

$$Q_c = \frac{C \cdot 3 \cdot V^2 \cdot 2 \cdot \pi \cdot f_n}{1 - p}$$

Example: $3 \times 331.5 \mu\text{F}$ at 400V/50Hz at $p = 7\%$

$$0.0003315 \cdot 3 \cdot 400^2 \cdot 314.16 / 1 - 0.07 = 53.8 \text{ kVAr}$$

Phase current of capacitor:

$$I = \frac{Q_c}{V \cdot \sqrt{3}} \quad \text{or} \quad Q_c = I \cdot V \cdot \sqrt{3}$$

Example: 25 kVAr at 400V

$$25000 / (400 \cdot 1.73) = 36 \text{ A}$$

V = Rated voltage (V)

I = Rated current (A)

f_n = Line frequency (Hz)

f_r = Resonance frequency (Hz)

p = Filtering factor

Q_c = Capacitor power (VAr)

C = Capacitance (F, farad)

P = Active power (W)

S = Apparent power (VA)

Q = Reactive Power (VAr)

I_n = Rated current of fuse (A)

U_n = Rated voltage of fuse (V)

Example: $Q_c = 25 \text{ kVAr}$, $U_{\text{main}} = 400\text{V}$.

$$I_n = 1,6 \cdot 36 = 57,6 \Rightarrow 63\text{A}, U_n = 690\text{V}, \text{gG fuse.}$$