

Cylindrical Power Factor Correction Capacitors

Technology of producing capacitors with metalized polypropylene(PP) films

The usage of plastic films with very thin thicknesses (4-12micron) as the electrical insulator was a big promotion in the LV capacitors manufacturing, technically and economically speaking. The very low thickness of these films create the significant reduction in raw material consumption, volume, weight and manufacturing cost of capacitors.

Metalized films

PKC Zinc alloy three layers metalized PP film is produced under the latest methods and world technology.

The base film is biaxial oriented polypropylene (BOPP) in micron thickness which will be then quoted with very thin layer of Zinc (approximately 95%) and aluminum (approximately 5%) in vacuum evaporation process. The zinc metal will keep the capacitance and capacitor specifications to be fixed over the time and aluminum metal will protect the film surface to be oxidized. Meantime Silver is coated on the film initially for preparation.

The combination of two metals together will result on a high stability of the electrical and chemical specifications of the capacitors. In one side the edge of the film has more metal coating and the other side edge is without metal coating. We call the non coated edge the free margin and the coated edge is called heavy edge. For producing capacitor two layers of film are put on each other and winded over a core.

Self-healing phenomena

The most important feature of Capacitors made with this type of film is self – healing.

Self- Healing process means if during the capacitor working status, the insulation between two electrodes is damaged for any reason and is broken down to cause short circuit in the MPP Film surface, then the huge current passing through the broken down point will create high heat and the metal layer will evaporate and that point will be an isolated non-conductive area without metalized layer and the capacitor continue working normally. This isolation area is so small that cannot affecting the capacity of the capacitor and is very little...to say that only 10000 self healing may lead to 1 Mfd. drop on the capacitance.

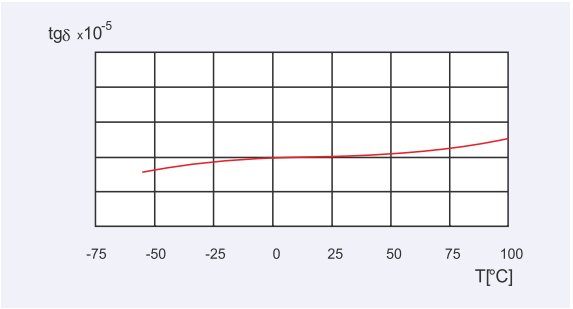
The plastic films are functioning as insulator and the metalized side is functioning as electrode.

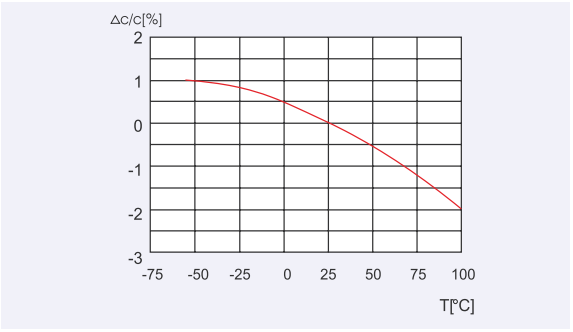
The advantages of self-healing capacitors:

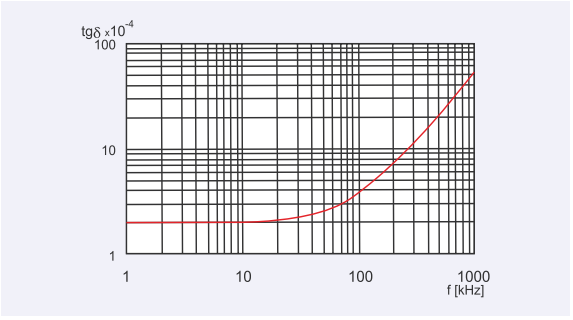
The most important advantages of using self-healing capacitor comparing with old generation of capacitors are :

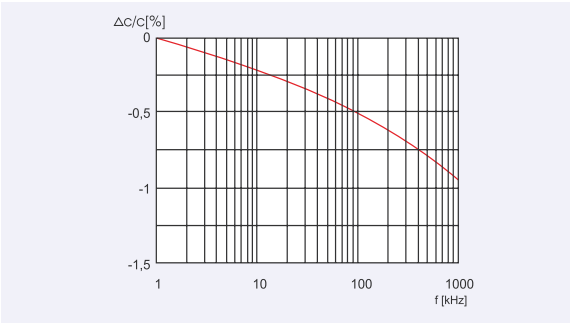
1- The lower weight and volume in comparison with the similar capacitors capacitances.
2- The self healing feature which causes the lowest drop in the capacitance if the electrical breakdown happens for the capacitor.
3- Due to the simple structure and low raw material the capacitors produced by this technology are economically feasible.
4- The lower losses of dielectric and capacitor will cause less heat and consequently more life time for the capacitors.

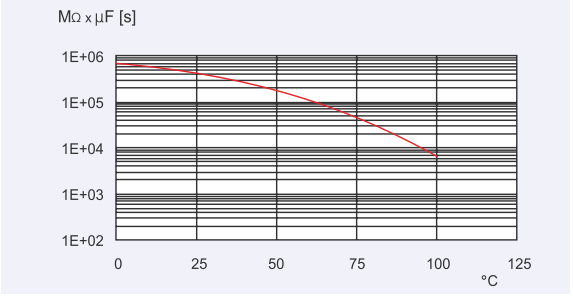
The diagrams are showing the electrical features of the capacitor produces with metalized film.











The general definitions according to the capacitor standards:

- Nominal Voltage (U_N): Is the suitable and effective alternative voltage (r.m.s) that the capacitor is designed for working under it.
- Nominal Capacitance (C_N): Is the suitable and effective capacitance that the capacitor is designed for.
- Nominal current (I_N): Is the suitable and effective alternative current (r.m.s) in the nominal voltage and frequency.
- Nominal frequency (f_N): Is the highest frequency that the capacitor is designed for working in.
- Capacitor losses: The active power consumed by the capacitor.

Overpressure disconnection system:

The capacitors like all other electrical products, have efficient life time.

Considering that the self healing capacitors will rarely face short-circuits, using only one HRC fuse cannot guarantee the safety of the capacitor and we have to use safety mechanism in the capacitor for timely overpressure disconnection.

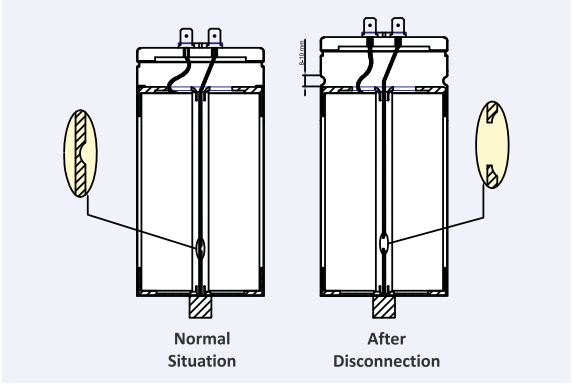
In this system, in order to prevent the capacitor from exploding or bursting because of rising inside pressure, the safety mechanism is provided by a folded crimp. Also the wires connecting the elements to the terminals are weakened in one point.

After that the gases produced due to the electrical breakdowns are appeared and cause the rising of pressure inside the capacitor, the lid is pushed upwards and the folded area will be open and the internal connections are broken and the current flow stops consequently.

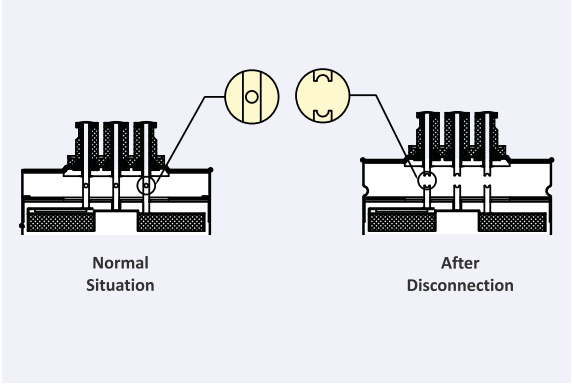
Few points to consider Overpressure disconnection system for better function:

1- Enough space above the capacitor to allow it having at least 2 cm.
increase in height.
2- Absolutely using Flexible wire or cable.
3- Making sure that The folded area of the capacitor is free to function.

To inform that the safety mechanism of PKC Capacitors are designed and applied according to the BS 7631 and EN/IEC60593.



Internal disconnection System for Single Phase Capacitors



Internal disconnection System for Three Phase Capacitors

PFC Cylindrical Capacitors/ Model PAC

Applications

- Low Voltage distribution networks.
- Fixed & Automatic capacitor banks for centralized compensation.
- Installing on electric motors, transformers & lighting circuits and...Individual or group compensation.
- Installing in the networks with harmonic makers equipments like UPS, Convertors, and three phase servo motors in considering all technical parameters...

Technical Data & Specification

Rated Power (KVAR) Rated Voltage (V) Rated Capacitance (µF)	According to Specification Table
Capacitance Tolerance	-5/+10
Rated Frequency (Hz)	50 (60 Hz on request)
Mean life expectancy	Up to 100.000 operating hours
Permitted Overload *	
- Max. permissible overvoltage (Vmax)	Rated Voltage +10% (8 h. in every 24 h.) Rated Voltage +10% (30 min. in every 24 h.) Rated Voltage +10% (5 min.) Rated Voltage +10% (1 min.)
- Max. permissible overcurrent (1max)	1.3 x Rated current
Permitted ambient temperature	-25 °C to 55 °C Max. temp. 55°C Max. mean 24 h = 45°C Max. mean 1 year = 35°C
Number of switching operations	Max. 5000 switching per year according to EN/IEC 60831/1&2
Dielectric loss Total loss	< 0.2 Watt / KVAR < 0.5 Watt / KVAR
Max. transient Inrush current	100 x Rated current
Max. discharge time	1 min. (from rated voltage to 75 V)
Internal connection	Delta (Δ)
Voltage Test - Between terminals - Terminal to Can (case)	2.15 Rated voltage, 2 Sec. 3 KVAC, 10 Sec.

Insulation level	3/8 KV AC
Safety Mechanism	- Self-healing technology - Overpressure disconnector
Protection **	IP 20
Can/Shape	Aluminum / Cylindrical
Max. permissible humidity	95%
Mounting - Position - Installation - Expansion space	 Vertical / Horizontal Indoor 2 cm (it is necessary to leave free space above the terminals to enable the overpressure protection device operates effectively.)
Max. permissible altitude	2000 m above sea level
Fixing/Grounding	By threaded stude M8 (for can diameter 45) / 5Nm M12 (for can diameter 50 mm and more) / 12 Nm
Filling Material	Non PCB
Terminal type	6.3 mm Tag. ST, MT & BT
Standard	EN/IEC 60831-1 & 2

* 200 times of over voltages higher than 15% can happen during the capacitor life time.

** Tag terminal Capacitors have plastic top cover(IP20)

Max. withstanding temperature according to the working class:

Temp. class	Max. ambient temp. (˚C)	Average temp. in 24 Hours (˚C)	Average temp. in 365 hours (˚C)
A	40	30	20
B	45	35	25
C	50	40	30
D	55	45	35

Dimension & technical spec. of the Single Phase Capacitors

Single Phase 250V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
0.83	42.3	3.3	Single Tag 6.3 mm	45×109	0.20
1	50.9	4.0	Single Tag 6.3 mm	45×139	0.21
1.5	76.4	6.0	Single Tag 6.3 mm	50×139	0.32
1.67	85.1	6.7	Single Tag 6.3 mm	55×139	0.35
2.5	127.4	10.0	Double Tag 6.3 mm	65×139	0.47

Single Phase 400V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
0.83	16.5	2.1	Single Tag 6.3 mm	45×85	0.20
1	19.9	2.5	Single Tag 6.3 mm	45×85	0.20
1.5	29.9	3.8	Single Tag 6.3 mm	45×109	0.20
1.67	33.2	4.2	Single Tag 6.3 mm	45×139	0.24
2.5	50	6.3	Single Tag 6.3 mm	50×139	0.32
3.33	66.3	8.3	Single Tag 6.3 mm	55×139	0.34
4.17	83	10.4	Double Tag 6.3 mm	60×139	0.48
5	100	12.5	Double Tag 6.3 mm	65×139	0.54

Single Phase 440V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
0.83	13.7	1.9	Single Tag 6.3 mm	45×85	0.20
1	16.4	2.3	Single Tag 6.3 mm	45×85	0.20
1.5	24.7	3.4	Single Tag 6.3 mm	45×109	0.20
1.67	27.5	3.8	Single Tag 6.3 mm	45×139	0.24
2.5	41.1	5.7	Single Tag 6.3 mm	50×139	0.32
3.33	54.8	7.6	Single Tag 6.3 mm	55×139	0.34
4.17	68.6	9.5	Double Tag 6.3 mm	65×139	0.48
5	82.2	11.4	Double Tag 6.3 mm	70×139	0.54

Single Phase 525V , 50Hz

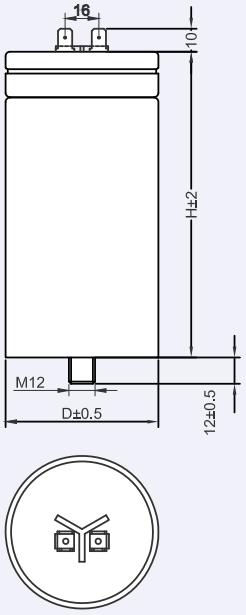
Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
0.83	9.6	1.6	Single Tag 6.3 mm	45×85	0.20
1	11.6	1.9	Single Tag 6.3 mm	45×109	0.20
1.5	17.3	2.9	Single Tag 6.3 mm	45×139	0.21
1.67	19.3	3.2	Single Tag 6.3 mm	45×139	0.24
2.5	28.9	4.8	Single Tag 6.3 mm	55×139	0.34
3.33	38.5	6.3	Double Tag 6.3 mm	60×139	0.40
4.17	48.2	7.9	Double Tag 6.3 mm	65×139	0.48
5	57.8	9.5	Double Tag 6.3 mm	70×139	0.54

Single Phase 660V , 50Hz

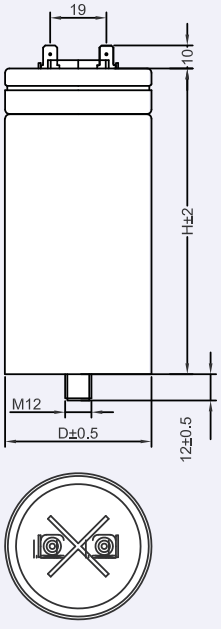
Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
0.83	6.1	1.3	Single Tag 6.3 mm	45×85	0.20
1	7.3	1.5	Single Tag 6.3 mm	45×85	0.20
1.5	11.0	2.3	Single Tag 6.3 mm	45×109	0.20
1.67	12.2	2.5	Single Tag 6.3 mm	45×139	0.24
2.5	18.3	3.8	Single Tag 6.3 mm	50×139	0.32
3.33	24.3	5.0	Single Tag 6.3 mm	55×139	0.34
4.17	30.5	6.3	Double Tag 6.3 mm	65×139	0.48
5	36.6	7.6	Double Tag 6.3 mm	70×139	0.53

Single Phase 690V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
0.83	5.6	1.2	Single Tag 6.3 mm	45×85	0.20
1	6.7	1.4	Single Tag 6.3 mm	45×85	0.20
1.5	10.0	2.2	Single Tag 6.3 mm	45×109	0.20
1.67	11.2	2.4	Single Tag 6.3 mm	45×139	0.21
2.5	16.7	3.6	Single Tag 6.3 mm	50×139	0.32
3.33	22.3	4.8	Single Tag 6.3 mm	55×139	0.34
4.17	27.9	6.0	Double Tag 6.3 mm	60×139	0.40
5	33.4	7.2	Double Tag 6.3 mm	65×139	0.48



Single Tag Terminal
Dia. 60mm up to 70mm



Single Tag Terminal
Up to Dia. of 55mm

Dimension & technical specification of the Three Phase Capacitors

Three Phase 400V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
1	6.6	1.4	Single Tag 6.3 mm	45×129	0.2
1.5	10.0	2.2	Single Tag 6.3 mm	45×129	0.2
2.5	16.6	3.6	Single Tag 6.3 mm	55×129	0.4
5	33.2	7.2	ST	70×150	0.7
7.5	49.8	10.8	ST	70×205	0.9
10	66.3	14.4	ST	70×230	1
12.5	82.9	18.0	ST	70×270	1.1
15	99.5	21.7	MT	85×280	1.8
20	132.7	28.9	MT	95×280	2.2
25	165.9	36.1	MT	100×280	2.4
30	199.0	43.3	MT	116×280	3.1
40	265	57.6	BT	116×370	4.1
50	331	72	BT	116×370	4.2

Three Phase 440V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
1	5.5	1.3	Single Tag 6.3 mm	45×129	0.2
1.5	8.2	2.0	Single Tag 6.3 mm	45×129	0.2
2.5	13.7	3.3	Single Tag 6.3 mm	55×129	0.4
5	27.4	6.6	ST	70×150	0.7
7.5	41.1	9.8	ST	70×205	0.9
10	54.8	13.1	ST	70×230	1
12.5	68.5	16.4	ST	70×270	1.2
15	82.2	19.7	MT	85×280	1.8
20	109.7	26.2	MT	95×280	2.2
25	137.1	32.8	MT	100×280	2.3
30	164.5	39.4	MT	116×280	3
40	219	52.4	BT	116×370	4.1
50	274	65.6	BT	116×370	4.2

Three Phase 525V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
1	3.9	1.1	Single Tag 6.3 mm	45×129	0.20
1.5	5.8	1.6	Single Tag 6.3 mm	55×129	0.35
2.5	9.6	2.7	Single Tag 6.3 mm	60×129	0.4
5	19.3	5.5	ST	70×150	0.7
7.5	28.9	8.2	ST	70×205	0.90
10	38.5	11.0	ST	70×270	1.2
12.5	48.1	13.7	MT	85×280	1.8
15	57.8	16.5	MT	85×280	1.8
20	77.0	22.0	MT	95×280	2.2
25	96.3	27.5	MT	116×280	3.2
30	115.5	33.0	MT	116×280	3.1
40	154	44	BT	116×370	4.1
50	192	55	BT	116×370	4.2

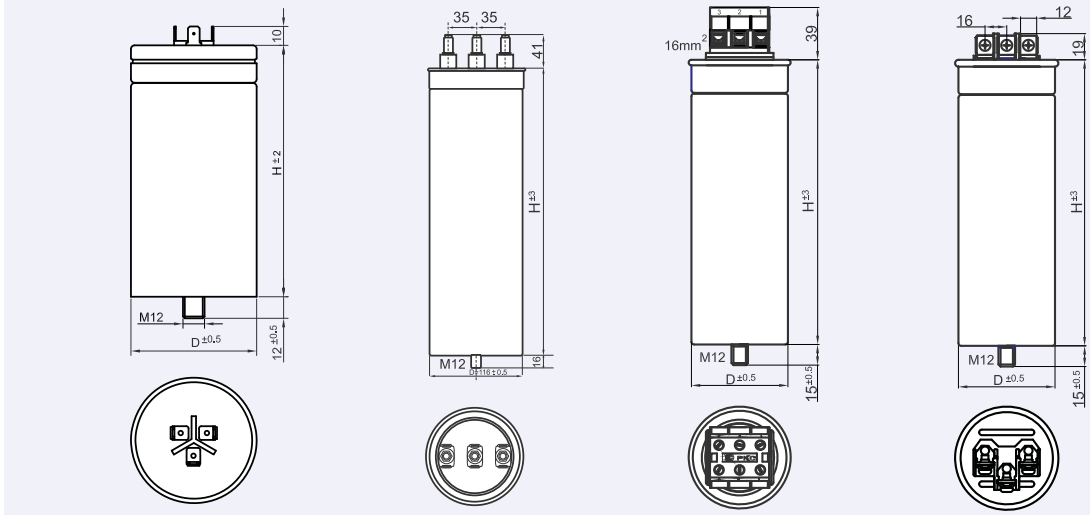
Three Phase 660V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
1	2.4	0.9	Single Tag 6.3 mm	45×129	0.2
1.5	3.7	1.3	Single Tag 6.3 mm	45×129	0.2
2.5	6.1	2.2	Single Tag 6.3 mm	55×129	0.4
5	12.2	4.4	ST	70×150	0.7
7.5	18.3	6.6	ST	70×205	0.9
10	24.4	8.7	ST	70×230	1
12.5	30.5	10.9	ST	70×270	1.2
15	36.6	13.1	MT	85×280	1.8
20	48.7	17.5	MT	95×280	2.2
25	60.9	21.9	MT	100×280	2.5
30	73.1	26.2	MT	116×280	3.2
40	97	35	BT	116×370	4.1
50	121	43.8	BT	116×370	4.2

Three Phase 690V , 50Hz

Nominal Power (Kvar)	Capacitance (μF)	Current (A)	Terminal	Dimension (D×H) (mm)	Net Weight (kg)
1	2.2	0.8	Single Tag 6.3 mm	45×129	0.2
1.5	3.3	1.3	Single Tag 6.3 mm	45×129	0.2
2.5	5.6	2.1	Single Tag 6.3 mm	55×129	0.4
5	11.1	4.2	ST	70×150	0.7
7.5	16.7	6.3	ST	70×205	0.9
10	22.3	8.4	ST	70×230	1
12.5	27.9	10.5	ST	70×270	1.2
15	33.4	12.6	MT	85×280	1.8
20	44.6	16.7	MT	95×280	2.2
25	55.7	20.9	MT	100×280	2.5
30	66.9	25.1	MT	116×280	3.2
40	89	33	BT	116×370	4.1
50	111	41	BT	116×370	4.2

All capacitors with ST terminal can be produced with MT terminals at request.



Tag Terminal | BT Terminal | MT Terminal | ST Terminal