



# Medium Voltage Power Capacitors

PFC Capacitors, Key Components and Systems

Power Quality Solutions

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# Medium Voltage Power Capacitors

## M V Capacitors



Medium Voltage power capacitors are designed and manufactured by using latest technology high quality material. These capacitors employ a technique where in the dielectric comprises several layers of polypropylene film impregnated with a non PCB liquid. The fluid is biodegradable in environment. Electrodes are made from thin aluminum foils.

### Specification:

- Conformance to Standard IEC-60871, IS 13925.

### Range:

- Up to 600 KVAR. in single unit in 24KV range.
- Higher ratings in form of banks.

### Features:

- Extended foil design.
- Bushings with desired BIL.
- Low energy consumption.
- M. S / S. S Containers.
- Available with internal / external fuses.
- Suitable for indoor and out door application.
- Banking: Star / Delta / Double Star.

### Accessories: On request

- Series reactors
- RVT / NCT
- CT / PT
- Isolator, LA'S, Circuit breakers etc.

## MV Capacitor Switch



EPCOS offers state of art Vacuum Capacitor Switches for various applications. Vacuum capacitor switches have an age over gas / air /oil type switches because of highest dielectric strength of vacuum. The core of capacitor switch is a specially designed vacuum contactor suitable for capacitor switching. The switch comprises of vacuum contactor and other associated equipments such as measuring CT, PT, auxiliary transformer etc.

### Specification:

- Rating Voltage: up to 24 KV.
- Highest System Voltage: 12 KV
- Rated frequency: 50 / 60 Hz.
- Number of phases: 3
- BIL: 20 KV AC / 60 KV peak /28 KV AC / 75 KV peak.
- Rated Current: 200 A / 400 A.
- Rated Single bank capacitor switching current: 50 A / 75 A.
- Rated short time current:4.5 KA /6KA/ 10KA 1second.
- Peak making current: 9 KA / 15 KA peak.
- Electrical endurance: 10000 operations.
- Mechanical endurance: 25000 operations.
- Mechanism: Solenoid.
- Controller type: Single step / Multi step.
- Installation: Out door / Indoor.
- Mounting: Pole mounted / Structure mounted.
- Power Interface: 6 bushing / 7 bushing.
- Indication: Switch ON / OFF.

### Features:

- Most Compact in its series.
- Light Weight, can be mounted on single pole / double pole structure.
- Eco friendly and high power switching capacity.
- Offers various power interface, control and protection options to meet various customized application needs.

## MV Vacuum Contactors



EPCOS offers state of art Vacuum Contactors for various applications. Vacuum contactors have an age over gas / air /oil type switches because of highest dielectric strength of vacuum. Vacuum contactors use state of art vacuum interrupters selected to perform the required duty. Vacuum contactors are used for lower current breaking e.g. motor current, capacitive current and other low inductive currents.

### Specification:

- Rated Voltage: up to 24KV
- Highest system Voltage: 7.2 KV / 12 KV/ 24KV.
- Rated frequency: 50 / 60 Hz.
- BIL: 20 KV AC / 60 KV peak / 28 KV AC / 75 KV peak.
- Number of phases: 3 / 2 / 1
- Rated Current: 200 A / 400 A.
- Rated motor switching current: 100A
- Rated single bank capacitor switching current: 50A.
- Rated short time current: 10KA per second.
- Peak making current: 9 KA / 15 KA peak.
- Electrical endurance: 10000 operations.
- Mechanical endurance: 25000 operations.
- Mechanism: Solenoid / Mechanical latch.
- Indication: Switch ON / OFF.

### Range:

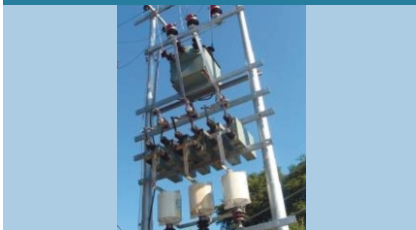
- Available from 200A to 630 A, 3.3 KV to 15 KV/ 24KV.

### Features:

- Encapsulated Vacuum Interrupter with a high dielectric strength and reliability.
- Choice of Solenoid and Mechanical mechanism.
- Mechanism tested for 30000 operations.
- Capable of operation from 70% to 120% of rated voltage of operating coil.
- Highly efficient in capacitor switching and DC switching applications.
- No arc produced is exposed to, atmosphere hence no fire hazards.
- Maintenance free electrical contacts. Compact with low foot prints saves panel space.
- High electrical and mechanical life.

# Medium Voltage Power Capacitors

**Pole Mounted RPC System**



The Pole Mounted Reactive Power Compensation (RPC) Systems are built around critical key components such as capacitor, capacitor switches and damping reactors etc designed and manufactured by EPCOS. These Reactive Power Compensation Systems are specially designed for single step automatic reactive power compensation system ideal for 24 KV feeders. These are self powered, highly reliable and suitable for unmanned lines requiring low service. The inrush current and fault current handling capacity of the switch is optimized considering the application. The switch is provided with a customized single step control box with a special controller having monitoring, control and protection features. Both capacitor switch and control box are designed for IP55 ingress protection and are suitable for out door installation.

**Specification:**

- Size / Rating: 50 to 1200 KVAR.
- Rated Voltage: 1.1KV to 24 KV
- Number of Steps: Single.
- Control mode: Auto / Manual.
- Control Parameter: Load current / load power factor.
- Damping reactor: 0.2% and 6% (optional)
- Configuration: Delta / Star.
- Installation: Out door.

**Features:**

- Self Powered highly reliable, suitable for unmanned lines requiring low services.
- Suitable for direct out door installation as designed with IP 55 ingress protection.
- The complete unit is self contained and does not need any auxiliary supply.

**Pad Mounted RPC System**



EPCOS offers indoor as well as out door Pad mounted / metal clad Reactive Power Compensation System for various applications. These are metal clad switched or fixed capacitor banks of various configurations customized for specific applications. Switched capacitor banks have specially designed and manufactured Vacuum contactors for switching of capacitor banks. The panels are designed for indoor as well out door installations with various degrees of ingress protection. Depending upon the application and configuration various values of damping reactors are provided to enhance the performance.

**Specification:**

- Size / Rating: 100 to 3600 KVAR.
- Rated Voltage: 1.1 KV to 24 KV
- Number of Steps: 1 - 8
- Control mode: Auto / Manual.
- Control Parameter: Load current / load power factor.
- Damping reactor: 0.2% and 6% (optional)
- Configuration: Delta / Star / Double star.
- Installation: Indoor / out door.

**Features:**

- Requires less space suitable for indoor / out door installation.
- Optimum compensation of reactive KVA in case of switched capacitor banks.
- Choice of cable entry locations.

**Station Type RPC System**



EPCOS offers turnkey solutions for station type Reactive Power Compensation Systems. These are open execution shunt capacitor banks of various ratings and configurations. The banks are fixed or switched. Switched bank use either special capacitor switches or Vacuum circuit breakers for switching. The capacitor switches are designed for multi-step switching and have capability of switching parallel connected capacitor banks with appropriate current limiting reactors. The banks are complete with PT, CT, NCT / RVT, Isolators, Lightning arrestors, Series Reactors and Circuit breaker with customized Control and Relay panel.

**Specification:**

- Size / Rating: 200 to 10000 KVAR.
- Rated Voltage: 6.6 / 11 / 22 / 33 KV
- Number of Steps: 1- 8
- Control mode: Auto / Manual.
- Control Parameter: Load Power Factor.
- Damping reactor: 0.2% and 6% (optional)
- Configuration: Delta / Star / Double star.
- Installation: Out door.

**Features:**

- Optimum compensation of reactive KVA in case of switched capacitor banks.
- Controllers with Data logging, remote control and communication facility.
- A single control panel with multi step controller to control multiple switches.

# Medium Voltage Power Capacitors



## Basic Construction

High voltage capacitors employ a technique wherein the dielectric comprises several layers of polypropylene film impregnated with an insulating fluid. Electrodes are made from thin aluminium foils. A high voltage capacitor is made up a number of such elements connected in a series - parallel arrangement. The total of number elements is determined by the capacitors power rating and operating voltage. Depending on capacitors rating each elements can be fuse protected. After impregnation the complete assembly is hermetically sealed inside a steel container.

## Internal Element Fuses

Modern power capacitors are designed to withstand high stresses where the electrical gradient in the dielectric is typically in excess of 50-60 volts per micron. Depending on the voltage rating the capacitors in EPCOS range incorporate highly efficient back-up protection so that each individual element is safeguarded by a built-in, series connected fuse. In the event of a localised breakdown of the dielectric, only the faulty element is disconnected by the fuse and any subsequent reduction in capacitor output is minimized.

## Capacitor Case

The CRCA container is treated with a primer and finish coat of paint to suit the application.

## The Dielectric

The all-film dielectric used in high voltage capacitors is manufactured from the most advanced polypropylene film available which has following benefits:

- Reduced dielectric losses
- Decreased variation of capacitance with ambient temperature, to obtain a more constant output.

## Impregnating Medium

The impregnation fluid has been specially formulated for power capacitors. It has been selected for both its physical and electrical properties and its high resistance to extremes of temperature. The fluid is non chlorine bio-degradable and contains no PCBs.

## Capacitor Bushing

Depending on requirements, one, two or three porcelain bushings are fitted to the container. These have impulse withstand ratings of 50KV, 75KV, 95KV, 125KV, 150KV, 170KV according to application.

## Standard

IS-13925(1): 2012, IEC 60871-1/2: 2005.

Shunt capacitors for AC power systems having rated voltage above 1000V.

# Medium Voltage Power Capacitors

Technical data : APP Capacitors	
<b>Type</b>	APP
<b>Rated Voltage</b>	As per requirement of capacitor bank voltage
<b>Rate frequency</b>	50/60Hz
<b>Connection</b>	Single phase/ Three phase units (depending on voltage rating)
<b>Tolerance on capacitance</b>	-5% to +15%
<b>Maximum permissible voltage</b>	$V_R + 10%$ (up to 12 h daily) / $V_R + 15%$ (up to 30 min daily)** $V_R + 20%$ (up to 5 min daily) / $V_R + 30%$ (up to 1 min daily)**
<b>Maximum permissible Current</b>	$1.3 \times I_n$ (rated current)
<b>Test voltage, terminal/terminal</b>	$2.15 \times V_R$ , AC 2s $4.0 \times V_R$ , DC 10s
<b>Test voltage, terminal/case</b>	$4.5 \times V_R$ , DC 10s
<b>Total losses</b>	< 0.1 W/KVAr
<b>Dielectric</b>	Polypropylene film
<b>Impregnant</b>	Non PCB oil
<b>Temperature range</b>	-25°C ~ +55°C
<b>Insulation level (BIL)</b>	50KV/ 75KV/ 95KV/ 125KV/ 150KV/ 170KV
<b>Internal Discharge Resistors</b>	Discharge resistors provided, shall discharge 50 V in 300 sec
<b>Capacitor unit protection</b>	Internal / External fuses depending on rating
<b>Creepage distance</b>	25mm/KV or Very high: 31mm/KV. Others available on request
<b>Enclosure</b>	CRCA/ Stainless steel with light gray and hermetically sealed.
<b>Bushing</b>	Porcelain, One, Two or Three
<b>Altitude</b>	not exceeding 1000m above sea level
<b>Humidity</b>	max.100%
<b>Installation</b>	Outdoor/ Indoor
<b>Reference standard</b>	IS-13925 (1): 2012, IEC 60871-1/2: 2005

\* other voltages available on request

\*\*  $V_{R}$  rated voltage

\*\*\*  $I_n$ : RMS line current that occurs at rated sinusoidal voltage and rated frequency, excluding transients.

Note : for capacitors with different features/parameters than above, please check with our nearest sales office



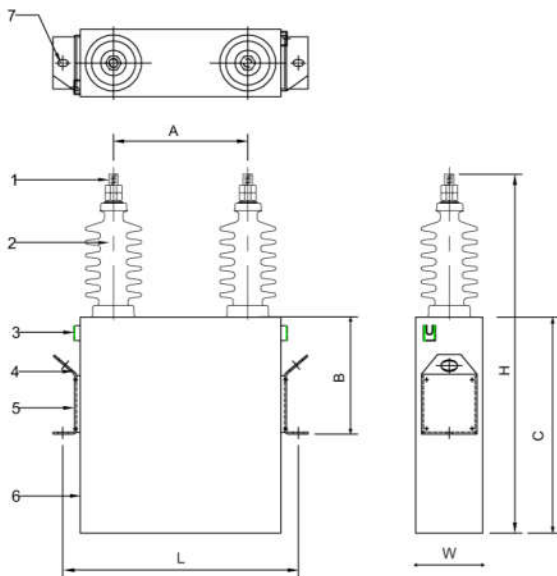
# Medium Voltage Power Capacitors

## HT-APP Capacitors - Single Phase

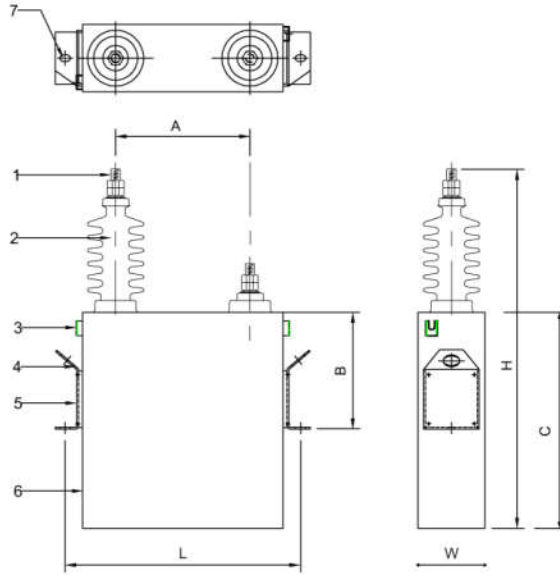
Rating KVar	Voltage V (AC)	Material code	I <sub>n</sub> A	BIL (KV) Min/Max	Dimensions (mm)						Bushing	Approx. weight Kg
					H	L	W	A	B	C		
<b>APP - 6600 V(AC) 1PH, 50Hz (Series B25161)</b>												
50	6600	B25161L0050B006	7.6	50/95	400	400	115	230	120	240	1/2	15
100	6600	B25161L0100B006	15.2	50/95	485	400	115	230	120	260	1/2	20
150	6600	B25161L0150B006	22.8	50/95	485	400	145	230	120	260	1/2	27
200	6600	B25161L0200B006	30.4	50/95	615	400	145	230	145	430	1/2	40
300	6600	B25161L0300B006	45.6	50/95	745	400	145	230	145	560	1/2	53
<b>APP - 8660 V(AC) 1PH, 50Hz (Series B25161)</b>												
100	8660	B25161L0100B008	11.5	50/95	615	400	115	230	120	260	1/2	20
150	8660	B25161L0150B008	17.3	50/95	615	400	145	230	120	260	1/2	27
200	8660	B25161L0200B008	23.1	50/95	745	400	145	230	145	430	1/2	40
300	8660	B25161L0300B008	34.6	50/95	745	400	145	230	145	560	1/2	53
<b>APP - 12700 V(AC) 1PH, 50Hz (Series B25161)</b>												
100	12700	B25161L0100B004	7.9	50/125	550	397	115	230	100	325	1/2	20
150	12700	B25161L0150B001	11.85	50/125	725	397	115	230	120	260	1/2	27
200	12700	B25161L0200B000	15.7	50/125	775	397	115	230	200	550	1/2	40
300	12700	B25161L0300B001	34.6	50/125	885	397	115	230	145	560	1/2	53
<b>APP - 13280 V(AC) 1PH, 50Hz (Series B25161)</b>												
100	13280	B25161L0100B003	7.2	50/125	725	400	115	230	120	260	1/2	20
150	13280	B25161L0150B003	10.8	50/125	725	400	145	230	120	260	1/2	27
200	13280	B25161L0200B003	14.5	50/125	885	400	145	230	145	430	1/2	40
300	13280	B25161L0300B003	21.6	50/125	885	400	145	230	145	560	1/2	53
<b>APP - 22130 V(AC) 1PH, 50Hz (Series B25161)</b>												
50	22130	B25161L0050B022	2.3	70/170	615	450	120	230	120	240	1/2	18
100	22130	B25161L0100B000	4.6	70/170	670	575	120	400	150	310	1/2	23
150	22130	B25161L0150B022	6.9	70/170	715	575	145	230	120	260	1/2	30
200	22130	B25161L0200B022	9.2	70/170	890	575	145	230	145	430	1/2	36
300	22130	B25161L0300B022	13.8	70/170	960	575	145	230	145	560	1/2	48

Note: Customized products with other voltage ratings, kvar-values, BIL ratings are available upon request.

### Two bushing diagram



### One bushing diagram



For more details on products and applications please contact our nearest sales office or write to us at [sales.in@epcos.com](mailto:sales.in@epcos.com)

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