

HIGH VOLTAGE POWER CAPACITORS



General

High voltage capacitor for power factor correction and harmonic filters are enclosed in steel containers fitted with porcelain capacitor bushings.

Basically, there are two types:

- Single phase (one or two bushings) capacitor units with internal element fuses suitable for connection to power system network of 11 KV and above or with high voltage high power machines.
- Three phase (three bushings) capacitor unit with internal element fuses for connection to power system busbars or equipments with voltage rating preferably less than 11 KV

In conventional capacitors, paper produced gases of abnormal level raising the internal pressure to a dangerous level.

Main Technical Characteristics

Based on the recommendations given in IS 13925 (part1):2012 IEC: 60871-1:1997, AB Power guarantees 10% over voltage ($1.10 \times U_n$) withstand capability for 12 hours in every 24 hours. 30% over current ($1.3 \times I_n$) carrying capacity continuously.

The overload capabilities stated above are to take care of voltage variations and harmonics which exist in the power system network.

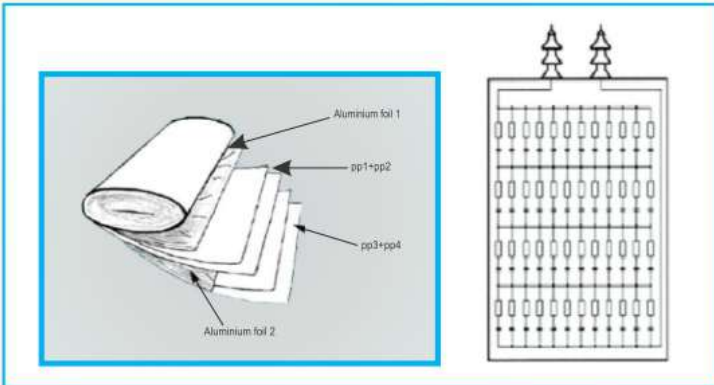
The liquid used for impregnation is capacitor oils which are biodegradable, non-PCB, and have strong withstand capability against partial discharges.

The capacitor units are fitted with internal discharge resistors to reduce the residual voltage from peak value of $\sqrt{2} \cdot U_n$ to 75 V within 10 minutes according to the recommendation in IEC after disconnection from power supply.

The internal fuse provided with each single phase element inside the unit disconnects the element from the circuit, in an unlikely event of it developing a defect like short circuit or over current and the capacitor unit continues to function, less one element.

If an element in a series group develops a defect when current is zero (Voltage is high) the fuse of defective element blows as a result of energy discharge from other parallel connected element of that group. In most of the cases the fuse operation takes place in this mode. However if the defect in the element occurs when current is high (Voltage is zero) the entire capacitor current from system pass through the defective element, and fuse operates as it cannot withstand such over current.

The loss of one element reduces the power output of unit marginally, say to the order of 2-4% of its normal output. The unit continues to function normal way and thus the life of capacitor is extended. The defect could be traced and take corrective actions, as required, in the next maintenance check.



Construction

The internal construction of a capacitor unit constitutes a group of single phase capacitor elements of suitable capacity. A number of such elements are connected in series-parallel to obtain designed power and voltage rating .

The number of groups of elements connected in series determines the voltage rating and number of parallel elements in a series group determines the power (kvar) rating of capacitor unit.

The capacitor units are manufactured with "All Film" technology. Capacitor elements are wound with biaxially oriented hazy polypropylene film of low losses and extended aluminum foils.

This technology has replaced the previous "paper-films", (mixed dielectric) capacitors to reduce dielectric loss considerably.

The capacitor losses are as low as 0.15 W/kvar and in addition, incase of an internal short circuit the risk of case rupture and explosion is avoided.

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Technical Data

All these developments are result of utilization of advanced technologies in capacitor field and regular R&D, and have made the product rigid and stable to withstand rigorous tests in the laboratories.

Rated voltage (Un)	Three phase 1-12 kv Single phase 1-24 kv
Power output(kvar)	25-500 kvar for three phase units 25-600 kvar for single phase units
Frequency	50/60 Hz
Reference standards	IS 13925 (PART 1) - 2012 IEC 60871-1:1997
Over voltage Max:	Un + 10% (12 hours in 24 hours only) Un + 15% (30 minutes) Un + 20% (5 minutes) Un + 30% (1minutes)
Over current (according to standard)	1.3 x In
Tolerance	-5 /+10%
Test Voltage (between terminals)	4.3 x Un DC 10s,or 2.15 x Un Ac 10s
Test Voltage (between terminals and container)	As per the table in IEC standard for 10s
Limits of inrush current	Max. 100 x In
Dielectric loss	0.07 W / kvar
Capacitor losses (approx)	0.15 W kvar (with resistors & internal fuses)
Basic Insulation level	20/60 kv; 28/75 kv; 38/95kv; 50/125kv; 70/170kv
Life expectation	>100,000 hours
IP Protection	IP 00, indoor and outdoor
Temperature Category	"C"- 40° / maximum of 50°
Types of cooling	Air Natural
Humidity	Maximum 95%
Altitude of site	1000 m above mean sea level
Mounting	Horizontal / vertical
Mounting arrangement	Mounting brackets
Device for internal protection	Internal element fuse
Device for external protection	Pressure sensor, Expulsion Fuses
Container	Steel
Dielectric	Polypropylene film
Impregnant	Non-PCB, biodegradable
Terminal bushing	Porcelain
Discharge Resistance	Provided - Residual voltage 75 V in 10 min

Other Voltage and KVAR ratings and specifications are available on request.

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