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# Data sheet

## HV static capacitor bank



# 1. GENERAL DESCRIPTION OF THE CAPACITOR BANK

## 1.1. GENERAL DATA

This offer details the technical specifications of an automatic capacitor bank for reactive energy compensation on a 5.5 kV and 50 Hz electrical network.

The capacitor bank will give 1,400 kvar at 5.5 kV at the electrical frequency of the network.

The general layout, global dimensions and included equipment are shown in the schematic :

**DOS18003:** Capacitor battery, 1.400 kvar at 5.5 kV.

The following tables show the most important data concerning the capacitor battery and the network.

| GENERAL NETWORK DATA           |             |
|--------------------------------|-------------|
| Network voltage                | 5.5 kV      |
| Insulation level               | 7.2 kV      |
| Ind. frequency test voltage    | 20 kV eff.  |
| Shock test voltage (1.2/50 us) | 60 Kv crête |
| Frequency                      | 50 Hz       |
| Short circuit current          | - kA        |

| GENERAL DATA CAPACITOR BANK |                      |
|-----------------------------|----------------------|
| Power to the network        | 1.400 kvar           |
| Rated power                 | 1.400 kvar           |
| Rated voltage               | 5.5 kV               |
| Network voltage             | 5.5 kV               |
| Frequency                   | 50 Hz                |
| Regulation                  | 1.2.2.               |
| Step number                 | 4                    |
| Rated power step            | 200+400+400+400 kvar |
| Installation                | Interior             |
| Protection degree           | IP 23                |

The capacitor bank is made with the following characteristics and components :

| Cabinet                      |  |
|------------------------------|--|
| Degree                       | IP23                                       |
| Supporting chassis materials |  |
| Central unit                 | Electrogalvanized steel                    |
| Cabinet                      | Electrogalvanized steel                    |
| Paint                        |  |
| Color                        | RAL 7035                                   |
| Accessories                  | Anti-condensation radiators<br>Thermostats |

## 1.2. DESCRIPTION OF COMPONENTS.

Below is a brief description of the basic components that compose the capacitor bank.

### LV control cabinet

The capacitor bank will have a basic voltage cabinet for the signals and manoeuvre and protection elements. The auxiliary sources for each element will be:

| Components  | Voltage                                  |
|---|--|
| <b>Contactor</b>  | <b>125Vcc (+10% tolerance)/ 230 Vac.</b> |
| <b>Auxiliary circuit (lighting, heating resistances heating, ventilation)</b> | <b>230 Vac</b>                           |

### General cabinet

The metal cabinet is self-transportable for the assembly of the articles above and designed for interior installation, the degree of protection is IP 23. The capacitor bank is built with profiles and removable panels in electro-galvanized steel and painted in RAL 7035. The entrance of the power cables will be made through the inferior part of the battery, as well as the cables for the control box/auxiliary contacts. Bar support with resin insulators.

\*Approximate dimensions of the capacitor battery, if you need other dimensions kindly (they will be confirmed in case of firm command):

|                |                |
|----------------|----------------|
| <b>Height:</b> | <b>2250 mm</b> |
| <b>Width:</b>  | <b>5000 mm</b> |
| <b>Depth:</b>  | <b>1100 mm</b> |

### Capacitors

The battery is composed by three-phase capacitors, all impregnated with JARYLEC biodegradable dielectric liquid, non-PCB fluid with high insulation resistance to ensure excellent electrical performance. The capacitors are manufactured with all-film technology, with very low dielectric losses, which offers us a long life.

Internal discharge resistors are also incorporated.

### Maneuvering

The automatic batteries have contactors for each step. The means used to avoid arcing is vacuum, which offers us an excellent control of capacitive loads and offers us a higher number of maneuvers compared to the circuit breaker.

### Protection

HPC fuses are included to protect capacitor batteries and associated equipment from short circuit. They protect against the thermal and electromagnetic effects of high short-circuit currents by limiting peak current values and interrupting currents within milliseconds.

### Shock inductances

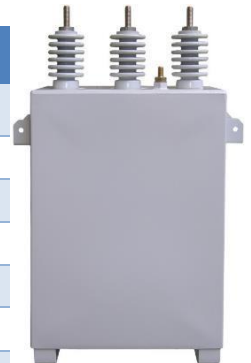
Each step of the offered automatic battery will be constituted with shock chokes for the limitation of current transients during the connection of the capacitors. As mentioned the main function of the chokes is to limit below 100 times the nominal current of the peak value at each switch-on.

| Single-phase power capacitor   |                                   |          |
|--------------------------------|-----------------------------------|----------|
| Electrical characteristics     | C1                                | C2       |
| Power                          | 200 kvar                          | 400 kvar |
| Voltage                        | 5.5 kV                            |          |
| Frequency                      | 50 Hz                             |          |
| Insulation level               | 28/75 kV                          |          |
| Tolerance                      | -5/+10%                           |          |
| N° of terminals                | 3                                 |          |
| Internal discharge resistances | 75V/10 minutes                    |          |
| Dielectric losses              | <0,2 W/kvar                       |          |
| Class T <sup>a</sup>           | Class C (-40/50°C)                |          |
| Average maximum temperature    | 40 °C                             |          |
| Permissible overvoltage        | 10% (12h en 24 each day)          |          |
| Allowable overcurrent          | 30%                               |          |
| Standards                      | IEC 60871-1 et IEC 60871-4        |          |
| QUANTITY (units)               | 1                                 | 3        |
| Constructive characteristics   |                                   |          |
| Dielectric                     | Polypropylene film                |          |
| Liquid dielectric              | Biodegradable (non PCB)           |          |
| Internal capacitor protection  | Fuse + protection pressure switch |          |
| Tank material                  | Stainless steel                   |          |
| Terminals                      | Porcelain                         |          |
| Color                          | RAL 7035                          |          |

## 2.3. COMPONENTS

The principal components for eachtep and their function are :

| No-load contactor          |                  |
|----------------------------|------------------|
| Electrical characteristics | CO1              |
| Rated current:             | 400 A            |
| Rated voltage:             | 7.2 kV           |
| Frequency:                 | 50/60 Hz         |
| Insulation level:          | 20/60 kV         |
| Dielectric:                | À Vide           |
| Breaking current:          | 4 kA             |
| Medium excitation:         | Continue         |
| Auxiliary source:          | 125 Vcc / 220Vac |
| Auxiliary Contacts:        | 3 NO + 3 NC      |
| QUANTITY (units)           | 4                |



| Damping inductances  |             |             |
|----------------------|-------------|-------------|
| L 1                  | L 1         | L 2         |
| Rated current        | 50 A        | 100 A       |
| Rated inductance     | 350 $\mu$ H | 100 $\mu$ H |
| Encapsulated         | Resin       | Résin       |
| Core                 | Air         | Air         |
| Thermal current      | 43·In/s     | 43·In/1s    |
| Dynamic current      | 2,5 - It    | 2,5·t       |
| Temperature category | Class B     | Class B     |
| Maximum temperature  | 40 °C       | 40°C        |
| Fixings              | M16         | M16         |
| Color                | RAL 8016    | RAL 8016    |
| Standard             | IEC 60289   | IEC 60289   |
| QUANTITY (units)     | 3           | 9           |



| Fuses                       |          |          |
|-----------------------------|----------|----------|
| Electrical characteristics: | FU 1     | FU 2     |
| Rated current               | 40 A     | 80 A     |
| Rated voltage               | 7.2 kV   | 7.2 kV   |
| Rated breaking current      | 63 kA    | 63 kA    |
| Minimum breaking current    | 280 A    | 600 A    |
| Fuse base                   | Included | included |
| Switch Micro breaker        | Included | included |
| QUANTITY (units)            | 3        | 9        |

### 3.3. STANDARDS

The capacitor bank and its components have been designed, manufactured and tested in accordance with the following standards :

|               |                              |
|---------------|------------------------------|
| HV capacitors | IEC 60871-1&2 et IEC 60871-4 |
| HV Contactors | IEC 60420/ IEC 60470         |
| Shock chokes  | IEC 60289                    |
| HPC fuses     | IEC 60549                    |

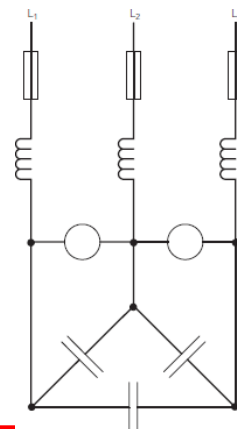
## 2. Wiring of the batteries

### 2.1. Delta wiring

#### Fixed type - Delta mounting

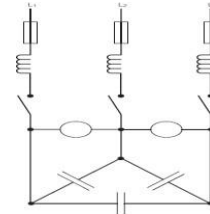
This type is used for low power batteries with a nominal voltage lower than 12 kV.

- Maximum voltage : 12 kV
- Puissance maxi : 2500 kVAr



- Installation : intérieure ou extérieure
- Composants possibles : selfs de choc, selfs de décharge, fusibles HPC, sectionneur de M.A.L.T, self anti-harmoniques,...
- Dimensions maxi (mm) : 2000 x 2000 H = 2200

### Type fixe avec contacteurs - Montage triangle



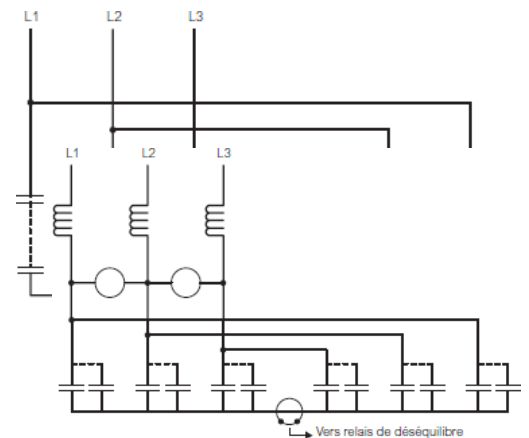
- Tension maxi : 12 kV
- Max. power: 2500 kVAr
- Installation: interior or exterior
- Possible components: surge chokes, discharge chokes, HPC fuses, M.A.L.T. disconnecter, anti-harmonic chokes,..
- Maximum dimensions i (mm) : 2000 x 2000 H = 2200

### 2.2. Double star wiring

This type of wiring is suitable for batteries of all powers and voltages (single-phase capacitors are subject in this case to single voltage).

An unbalance protection (transformer and current relay) permanently controls the unbalance intensity between the two neutral points and, in case of internal faults of a capacitor, opens the switching organ of the battery.

- Maximum voltage: 36 kV
- Maximum power: 20000 kVAr
- Installation : interior or exterior
- Installation : interior or exterior
- Composants possibles : selfs de choc, selfs de décharge, relais de déséquilibre, TC de déséquilibre...
- Maximum dimensions (mm) : 3500 x 2000 H = 4000



### 2.3. Fixed type with chokes - Double star mounting.

- Maximum voltage: 24 kV
- Maximum power : 5000 kVAr
- Installation : interior or exterior
- Possible components : surge chokes, discharge chokes, unbalance relays, unbalance CTs...
- Maximum dimensions (mm) : 2500 x 2000 H = 2200

### 2.4. H-wiring :

This type of wiring is intended for single-phase MV batteries and three-phase HV batteries of high power. In the case of three-phase batteries, the unbalance is controlled on each phase. This unbalance control system can be applied to both star and delta batteries.