

SERVICE INSTRUCTIONS FOR LOW VOLTAGE POWER TUBULAR CAPACITOR

1. Installation.



The installation of the capacitors should consider the rules and recommendations of **IEC 60831-1/2** Standard. The capacitors are for **indoor** installation away from heat sources and in well-ventilated places. There shall be a minimum distance of **20 mm** between capacitors. Check that the voltage and frequency given on the capacitor name plate are appropriate for the mains where it is to be installed.


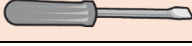

Connection cables will be sized for minimum **1.43 times** the rated current of the capacitor. We recommend not using the capacitor terminals to connect in parallel other capacitors.

The control equipment shall be of sufficient capacity to withstand the heavy capacitor switch in currents which can arrive to be **100 times their rated current** (we recommend that you check with the equipment manufacturers and use contactors with preload resistors and/or limiting choke coils).

The capacitors shall be protected against possible short-circuits by fuses or automatic switches. The fuses shall be sized for **1.3 to 1.8 times** the capacitor rated current. The capacitors shall be protected against possible leakage by earth leakage relay with adjustable delay time and sensitivity. The capacitor box shall be earthed by means of the pertinent terminal.

2. Commissioning

2.1 Check that the terminals are clean and the connections tight.

| Terminals |  |  |  |
|---------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Phase connection according to terminal type | 16 mm ² | M4x12 / PH1 | 1,2 ... 1,7 Nm |
| | 25 mm ² | M5x12 / PH2 | 2,0 ... 2,5 Nm |
| | 35 mm ² | M6x16 / Allen Hexagonal 4 mm | 2,5 ... 4,0 Nm |
| Earth Connection | - | M12 | 5,0 Nm |

2.2 Connect the capacitors.

2.3 Check that the terminal voltage and the current drawn do not exceed the limits given in Section 3.2 and 3.3.

2.4 It is desirable to repeat these measurements several times during the early days of service, particularly during low load hours.

2.5 Check that the ambient temperature does not exceed the levels given in Section 3.1.

3. Operating conditions

3.1 Temperature

The operating temperature is an extremely important parameter for the reliable capacitor operation. The capacitors are classified in categories according to the ambient temperature at which they may operate.

The ambient temperature shall never exceed the level stated for that temperature category. To check the capacitor working conditions, the air temperature is measured at steady state at the hottest point between two capacitors.

When only one capacitor is installed, the air temperature is measured at 2/3 of its height at a distance of 0.1 m.

The **LIFASA S.A.U.** Power Capacitors belong to the temperature category C. The IEC 60831 standard lays down the following limiting levels for this category:

| Air Temperature | | |
|-----------------|-------------------------------|--------|
| Maximum value | Highest mean over a period of | |
| | 24 hours | 1 year |
| 55°C | 45°C | 35°C |

Note: Operation at higher temperatures reduces the life of the condenser. Installation of forced cooling should be considered.

3.2 Voltage

Reliable operation of the capacitors requires the service voltage not to exceed the rated voltage. Nevertheless, under special conditions not foreseen at the time of installation, overvoltages within the following limits are allowed:

| Overload Factor x U_N | Maximum Overvoltage Duration |
|-------------------------|------------------------------|
| 1,0 x U_N | Continua |
| 1,10 x U_N | 8 hours in every 24 hours |
| 1,15 x U_N | 1/2 hour in every 24 hours |

Note: operating under overload conditions considerably shortens the capacitor life.

3.3 Currents and Harmonics

It should be checked that the r.m.s. value of the current in the capacitor should not exceed **1.3 times** the rated current thereof. If the current in the capacitor is above 1.3 times the rated current (due to **harmonics** or due to a **supply voltage above the rated voltage**), the lifetime of these capacitors can be seriously affected. Besides, they could cause serious damages. As indicated for voltage, it should be remembered that operating under overload conditions considerably shortens the capacitor life. If excessive currents are detected, the capacitors should be disconnected and **LIFASA S.A.U.** should be consulted to find the best solution to the problem (harmonics filters, etc.).

4. Power Capacitor disconnection.

The capacitors are equipped with discharge resistors reducing the terminal voltage to a value below 75 V within 3 minutes of being disconnected from the mains (according to IEC 60831 Standard).

WARNING: Before handling a capacitor, it should always be switched off from the mains, followed by 5 minutes wait and the terminals should be short-circuited and earthed.

If the capacitors units are to be installed in an automatic Capacitor Bank, **fast discharge resistors** should be installed in the low voltage contactors, which will ensure a maximum residual voltage in the terminals of the capacitors units smaller than 0.1 times the rated voltage before allowing reconnection.

5. Maintenance

Before handling the terminals of a capacitor units or a capacitor bank, read the previous instruction. The maintenance required by power capacitors is minimal, but necessary to ensure correct operation. It is recommended to carry out these maintenance operations depending on the duration of operation of the capacitor or capacitor bank.

| | |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monthly | <ul style="list-style-type: none"> • Visually checking the capacitors units. • Checking the protection fuses. • Chequing the air Temperature. • Checking the operation of the capacitor at operating voltage (especially in times of low load) |
| Hal Yearly | <ul style="list-style-type: none"> • Checking the current of each phase of the Capacitor. |
| Annually | <ul style="list-style-type: none"> • Cleaning terminals of capacitors and insulators • Checking the tightening torque of the connections on the terminals. • Checking the correct operation of the switching devices. Low Voltage Contactors. • Checking the current of each phase of the Capacitor. |

6. Warranty

LIFASA S.A.U. guarantees its products against any manufacturing defects for a period of 2 years from the date of purchase. In no case shall this guarantee last longer than 18 months from the commissioning. In case of Capacitor Banks with automatic regulation, this guarantee does not cover neither those protective devices (fuses) nor the components of the operating equipment that are subject to wear and tear.

LIFASA S.A.U. will repair or replace, as it deems fit, any defective product that is returned within the term of guarantee.

This guarantee shall be considered null and void if the product installation and maintenance instructions have not been followed or if the apparatus has been misused in any way.