Electrical & Other Performance

1. The capacitor is designed for maximum operation at rated voltage due to the extremely high KVAR value in the compact container. The unit may be operated at 105% of rated voltage for 12 hours in a period of 24 hours.

2. The maximum permissible continuous current as a result of over voltage and harmonics is 1.35 times the rated current.

3. The following routine tests are performed on every capacitor according to the stipulations of the applied standard.

   a. **Dielectric Strength -**
   The capacitor will withstand the following applied test voltage between terminals and also between shorted terminals (joined together) and container without failure.
      1. Test Between terminals DC test voltage : 4.3 times the rated voltage for 10 seconds.
      2. Test shorted terminal & Container AC test Voltage : 2.15 times the rated voltage, with a minimum 2000 V for 10 seconds.

   b. **Capacitance (Output)** —
   The capacitance value is measured by means of an A.C. bridge at room temperature and must be within ± 10% of Basic value. The output (KVAR) is calculated from the obtained capacitance value accordingly.

   c. **Insulation Resistance** —
   The insulation resistance between the terminals (joined together) and the container is measured by means of direct deflection method at 1000 V. The I.R. must exceed min 50 mega-ohms.

   d. **Sealing -**
   The capacitor must be free of leaks after storage at 60°C for not less than 2 hours.

4. The following sample tests are conducted as proof of capacitor design integrity and suitability for operation under the specified conditions.

a. **Dielectric Loss -**

The dielectric loss dissipated by the cooling water is 0.4 watt/KVAR maximum.
The applicable formula is :
Loss = P – (70 QT)
in which -
P = active power in watts
Q = rate of water flow in litres per minute.
T = temperature rise of the water in degree Celcius.

b. **Thermal Stability —**

The thermal stability test is carried out for 12 hours according to the stipulations of the applied standard. Throughout the last 8 hours of the test, the maximum allowable temperature rise is 1 °C and the maximum allowable capacitance variation is 2% from the value measured before the test.

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Water Cooled Capacitor

For Induction Heating & Melting Apparatus

Shreem Electric Ltd.

General Electric U.S.A. Licensee Company

Water Cooled Capacitor

For Induction Heating & Melting Apparatus

A high reliability water cooled capacitor for the improvement of an inherently low power factor, associated with inductive heating apparatus. Applications include melting furnaces, billet heating, forging and heat treating.

Applied Standard

The capacitor is designed manufactured and tested to meet the provisions of the latest revision to IEC Publication 110 and IS : 9251 -1979.

Operating Conditions

Installation : Indoor

Ambient temperature : 10°C to 50°C.

Altitude : Not exceeding 1.500 meters above sea level

Design and Construction

1. The internal assembly of the capacitor consists of several flattened elements constructed with multiple layers of impregnated synthetic dielectric film and filled with non-PCB, pollution free, synthetic insulating agent.
2. The capacitor is cooled by water flowing through copper coil tubing in direct contact with the edge of dielectrics on both sides of the roll. The cooling coil is a continuous copper tube terminated at top side of capacitor.
3. The non magnetic container is used to assure minimum heat generation when operating at high frequencies, the Black Phenolic Plenco terminal bushings which comprise one pole are hermetically fixed to the capacitor container and equipped with a heavy Copper stud having a suitable current carrying capacity for the rating. The other pole of all sections is common to the cooling coil.

INSTRUCTIONS FOR INSTALLATION, OPERATION & MAINTENANCE :

Mounting

a. The preferable mounting is with bushings on the top surface. The broad sides of the capacitor container are not to be clamped under pressure so as to prevent potential damage due to expansion of the liquid at operating temperatures.

b. Capacitor installations should be protected by suitable enclosures, guardrails, and/or elevation in accordance with the National Electrical Code of the country in which the capacitors are used.

c. The capacitors should be mounted so that there is a minimum of 30 mm between units.

d. For electrical connection to the capacitors, a flexible connection between the bus bar and the capacitor terminals, is recommended to eliminate the possibility of placing severe mechanical strain on the terminals.

e. Terminal nut tightening to 15 ft-lbs maximum is recommended in order to prevent gasket seal breakage or thread stripping.

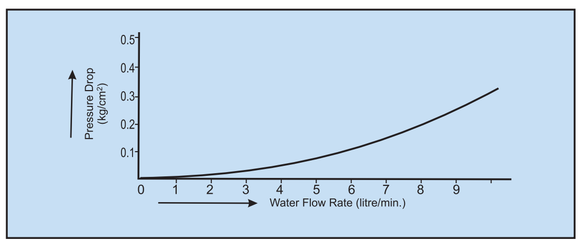
Cooling System and Water

a. Metallic connection between the capacitor containers and external cooling water pipes must be prevented by using non-conductive tubing such as a rubber hose. Likewise the water connection between individual capacitors should also be non-conducting because a difference of potential may exist between the capacitor containers. The length of non-conductive tubing required will depend on local conditions such as the resistivity of water at the outlet temperature and the amount of leakage current permitted.

b. Reasonably clean cooling water must be supplied at any suitable pressure up to 150 psi with a recommended minimum flow of 1 GPM (3.8 ltr/min) per capacitor. The outlet water temperature should not exceed 45°C during continuous operation at rated voltage and frequency. To prevent copper erosion due to high velocity water, the flow should be limited to 1GPM (3.8 lit/min)

c. A number of capacitor cooling coils may be connected in series provided the water pressure is sufficient to satisfy the above conditions.

d. The curve below shows the approximate pressure drop for various water flow rotes.



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Operation -

The operating ambient temperature range of the capacitor is 10°C to 50°C. When the capacitor is used in an enclosed environment with other heat-generating equipment such as transformers and/or reactors, the internal temperature should be kept below 50°C through air ventilation. Make certain that water is flowing in the cooling coil before energizing a capacitor in addition the temperature of the outgoing cooling water should not exceed 45°C in normal operation.

Maintenance –

a. Before doing any work on the capacitor or equipment, power must be switched off. For safety purposes, allow time for the capacitor to discharge and then short the terminals together to ground before touching live parts, A warning is attached to each capacitor container to note the need for protection against shocks.

b. Insulating capacitor bushings and bus bar supports must be cleaned periodically depending on operating conditions.

c. If units are be left idle below freezing temperatures after operation, the cooling coil should be blown free of water with compressed air or water flow should be continuous to prevent freezing.

Performance Guarantee

Guarantee for 12 months from the date of commissioning or 18 months from the date of dispatch

NAME PLATE INSCRIPTION :

The following is provided on capacitor :

a. Manufacturers name.
b. Manufacturers identification number.
c. Rated output in KVAR.
d. Rated frequency.
e. Rated current.
f. Type of Impregnent.
g. Weight

C M Y K