

Mechanical Shock and Drop Test of a Variable Vacuum Capacitor

A number of customers returned capacitors of various types for evaluation. From time to time the examinations revealed, that these were dropped along the way. This resulted in the destruction of the capacitors. Test of the packaging did not show the root cause. Since the customers are concerned about these findings COMET performed drop tests of capacitors as described below. The test results are also applicable to types using the same envelope i.e. the types of the "Basic-Con Series".

1. Mechanical shock test

Test number: 4922 11690

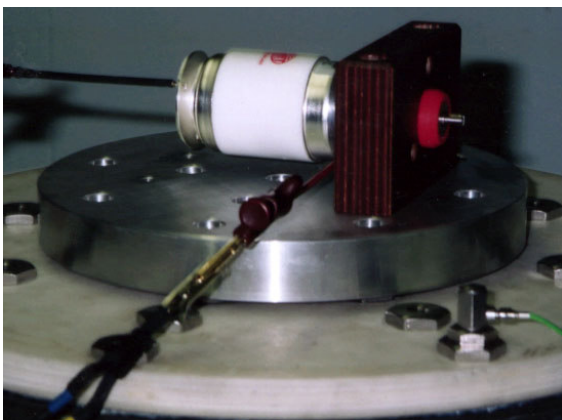
Test item: Vacuum Capacitor CVBA-500BC/5-DEA-CL

Used equipment: Shaker V 850 No 141
Control unit PUMA No 377
Accelerometer S/N C-10808

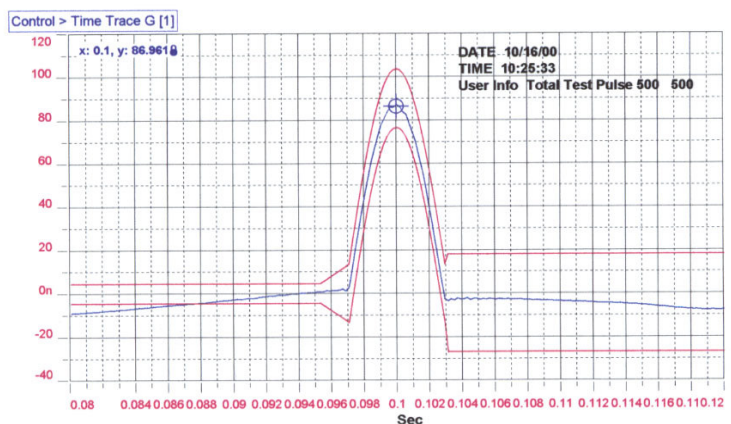
Type of test: Mechanical shock test, perpendicular to the axis of the capacitor.
Test object mounted on one side only. (see picture 1)
Classical half-sine shock with a shock duration of app. 6 msec.
The acceleration was measured at the test specimen.

Test sequence: 1. Single shocks from 40 g to 90 g in steps of 10g
2. Repetitive shocks in positive and negative direction, 10 shocks at a level of 60 g
3. Repetitive shocks: In positive and negative direction, 500 shocks at a level of ca 90 g (obtained levels: 87 g pos. / 82 g neg.)

Results: The electrical and mechanical parameters of the capacitor after shock tests of up to 87 g were within the specification.



Picture 1: Set up on shaker for shock test
(Capacitor is mounted on variable end only)



Graph 1: Typical plot of shock test

2. Drop test

Test number: 4922 11691

Test item: Vacuum Capacitor CVBA-500BC/5-DEA-L S/N H-21854, H-21856

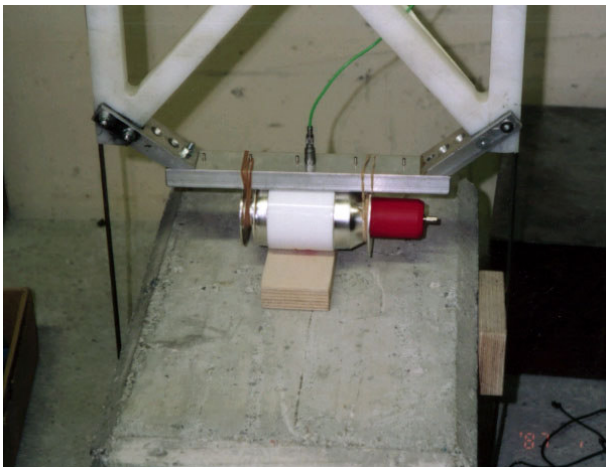
Used equipment: Drop tower No 260
FFT Analyzer No 271

Type of test: Drop test, force perpendicular to the axis of the capacitor

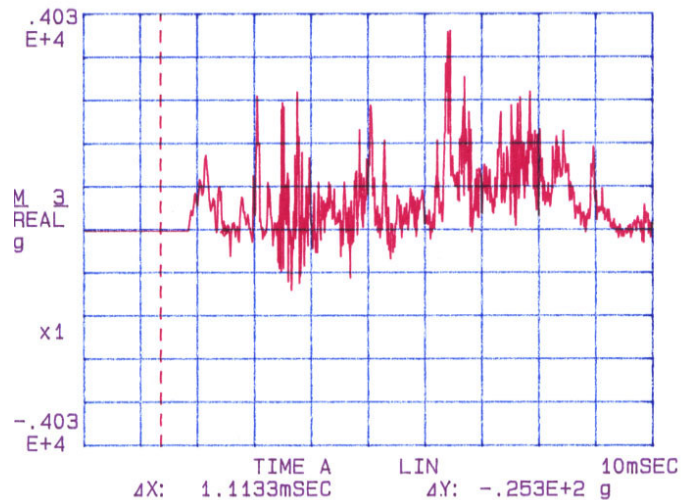
Drop height: variable, from 2.5 to 30 cm

Drop base: Laminated birche wood (hard wood) of 20mm thickness on concrete

Conclusion: Any drop on a hard surface (e.g. concrete) higher than 10 cm is detrimental for the integrity of the capacitor. Drop heights over 10 cm result in a permanent shift of the maximum capacitance value of approximately 15%. A drop of 30 cm or higher leads to the destruction of the capacitor.



Picture 2: Set up for drop test



Graph 2: Plot from drop test: Height 20cm