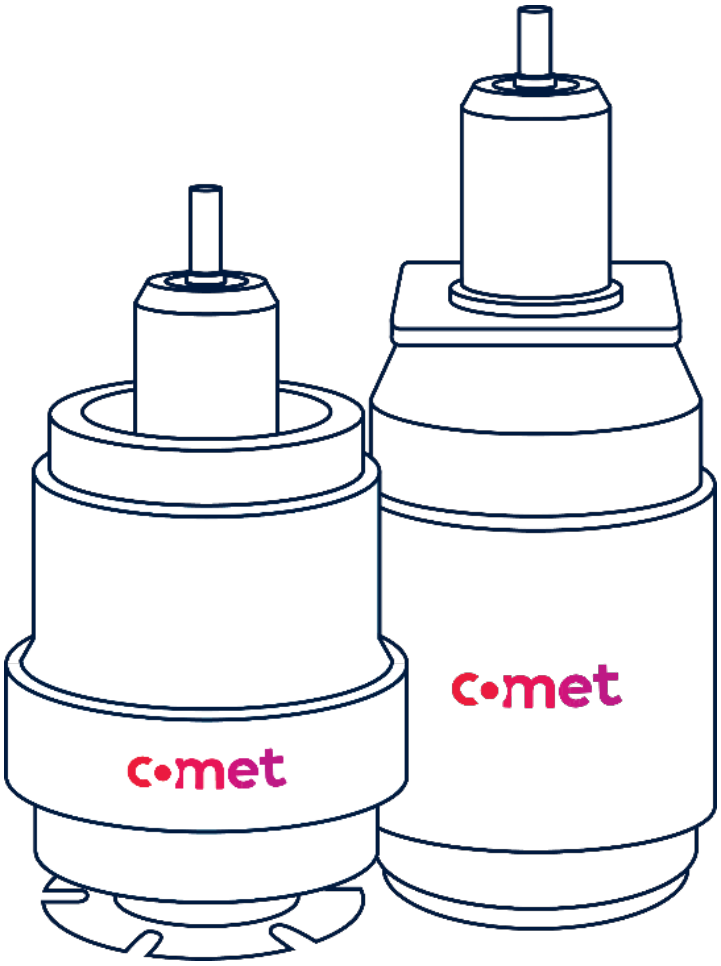
Service Bulletin-42 | Vacuum Capacitors

Environmental and Life Cycle Testing of the Comet CTMN Series



Comet AG
Herrengasse 10 | CH-3137 Flamatt
T +41 31 744 95 00 | pct@comet.tech
pct.comet.tech

Lifecycle test (test condition, number of samples, reached cycles)

A set of 26 individual Trimmer Caps were tested to determine the lifetime in terms of cycles of the Trimmer Cap drive system. The tests were performed on the COMET cycling test benches.
The Devices under Test (DUT) were cycled until failure. One cycle starts from the Cmax-position to Cmin-position and back to Cmax-position. The mean value of the reached cycles is 5458, independent of the capacitance value. **Figure 1** shows the Weibull distribution. From the result of this analysis COMET will guarantee 50 Cycles for the CTMN Series.

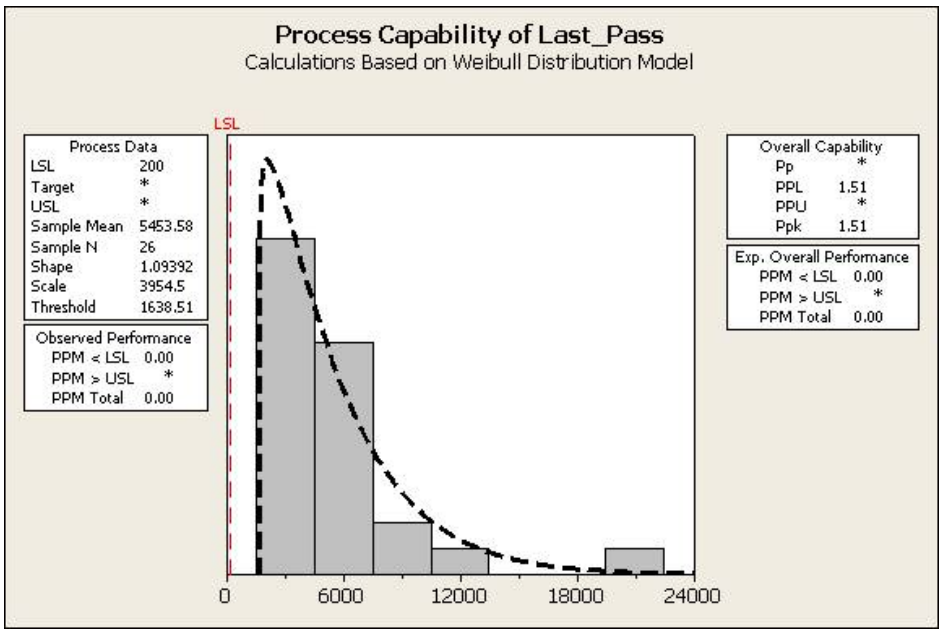


Figure 1: Chart of the Weibull-Analysis of the CTMN Life Cycle tests.

ISTA Vibration Test

Vibration testing was performed to check the requirement to meet ISTA specifications.

The test was performed at an external lab, which is well experienced in heavy load vibration tests**. Figure 2** displays the principle experimental setup of the CTMN vibration test with the related axis directions, as well as a photo of the vibration setup of tested CTMN is shown.

Table A1 gives the test parameters the characteristics of DUT with sealed drive screw compared to unsealed drive screws were tested. A Random Vibrations test according IEC 60068-2-64:2008 Test Fh was performed. Parameters from ISTA 2A:2008 were modified. Two additional tests were performed, where the load was doubled from step to step. (See Table A2 and A3)

A matching network level test has also been undertaken with one of Comet's semi-conductor clients, and the capacities remained constant within the measurement accuracy.

In result, all DUT are not affected by the applied vibration levels. The measured capacity is constant within the measurement accuracy.

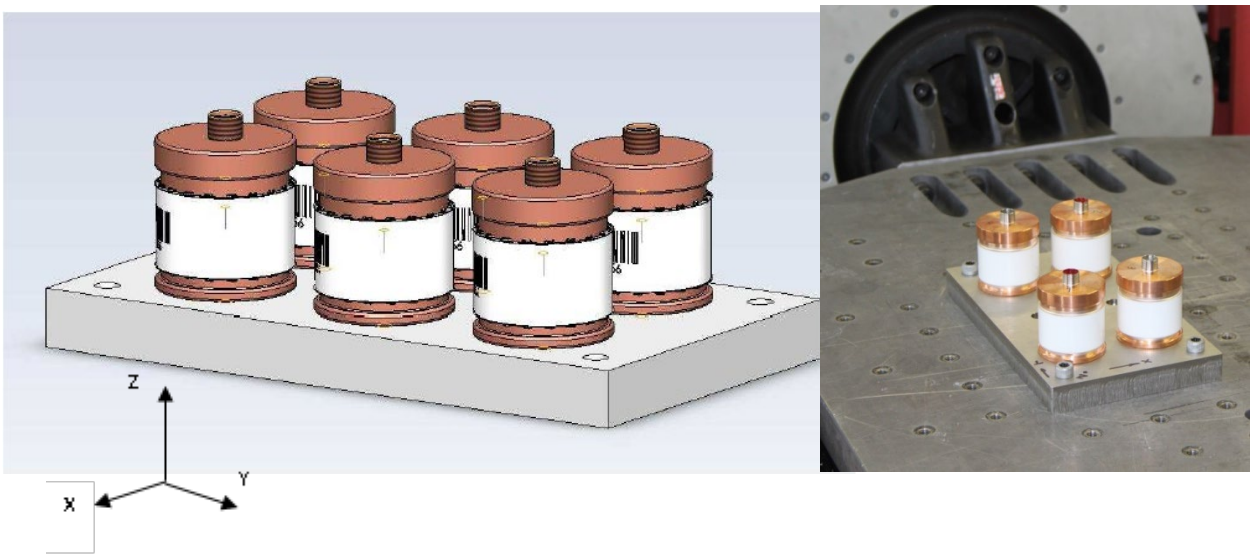


Figure 2: Principle experimental setup of the CTMN vibration test

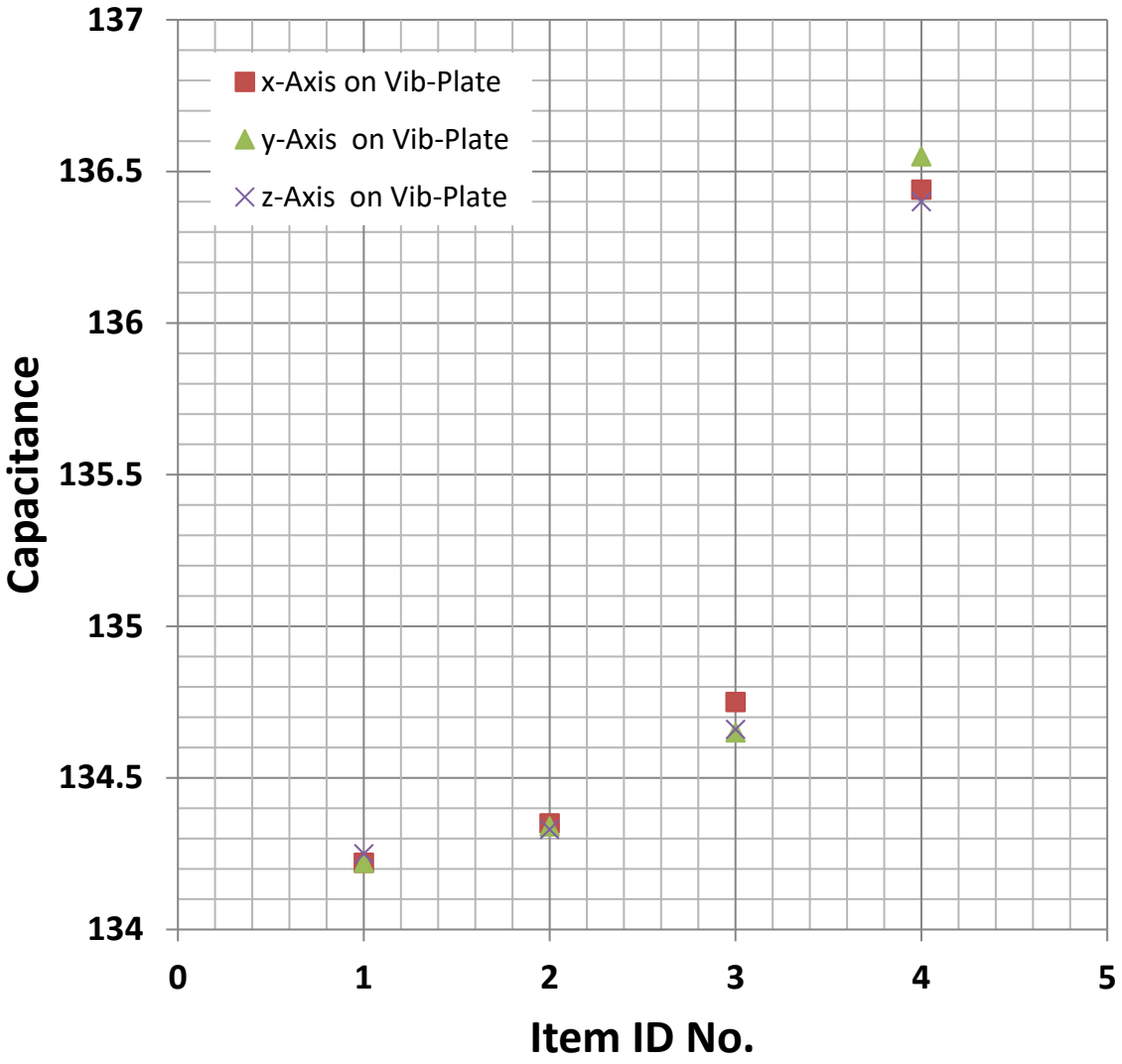


Figure 3: Capacitance of examples measured after vibration in different axis.

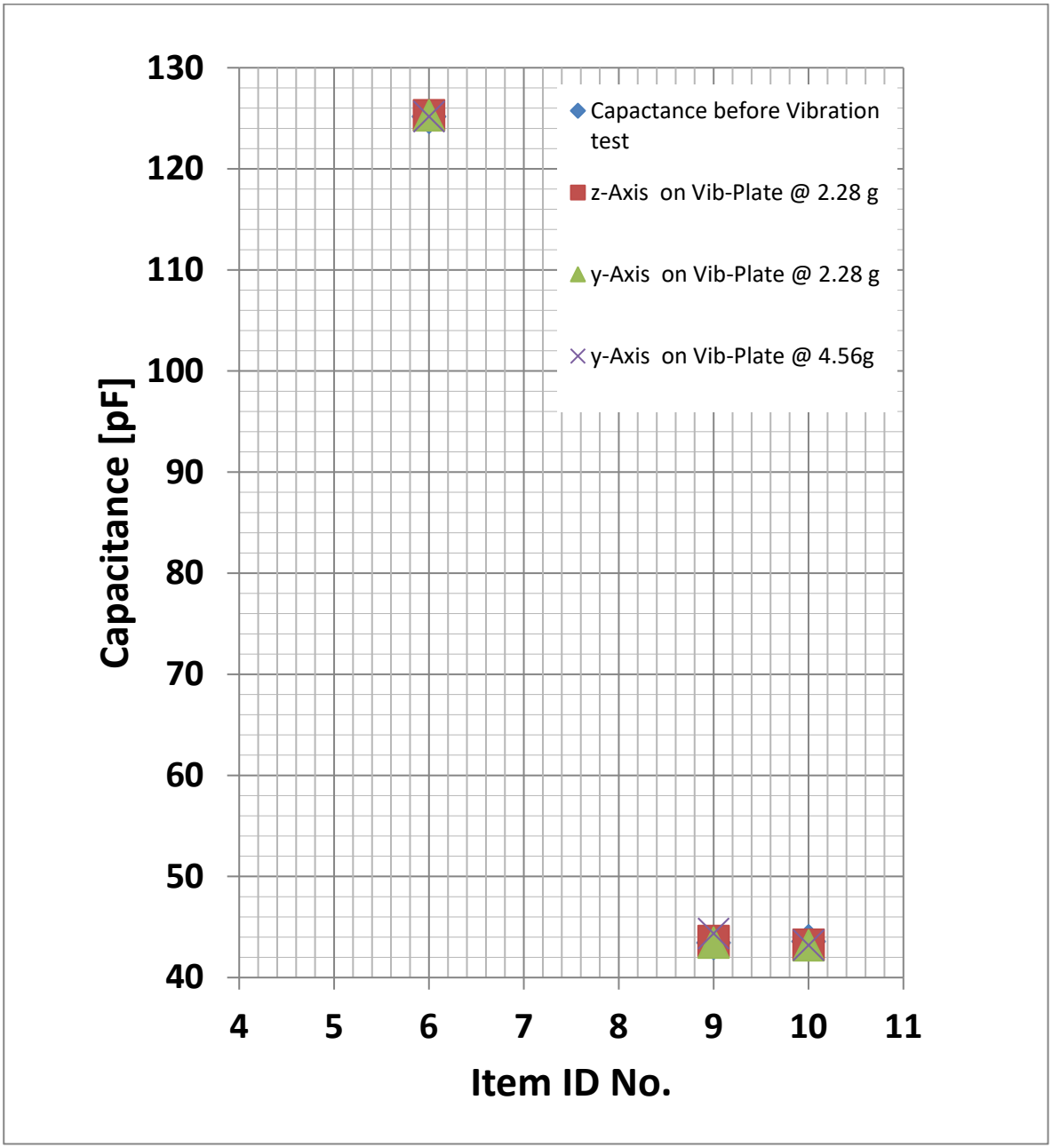


Figure 4: Capacitance of examples measured after vibration at different g-levels

Shock test

In addition to the ISTA-vibration test a simple drop test was performed to determine an acceptable shock level for Trimmer Caps. A deceleration of approximately 1500 m/s2 shock at a drop of 10mm results in a capacity change ΔC of ca. 0.5 pF for an 80 pF electrode. Every additional increase of 10mm in the drop height results in a change of approximately 1% in capacity.

RF Testing

Trimmer Caps were also RF tested in the COMET Test bench shown in Figure 5.

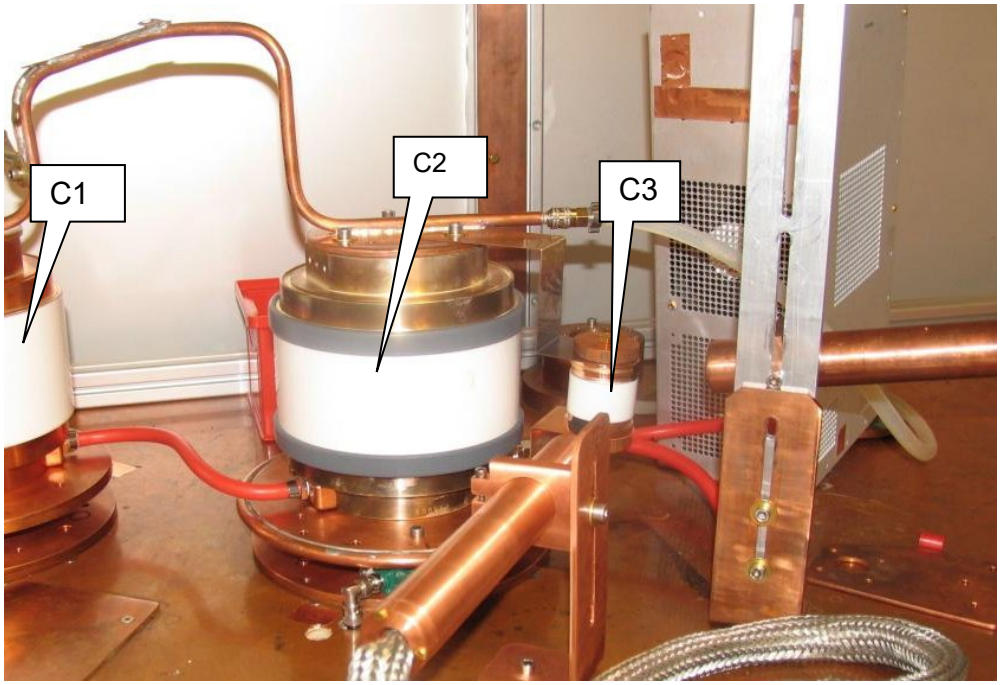


Figure 5: Set up for RF testing in the COMET test bench. C1-Load C2 - Tune C3 (DUT) parallel to C2. C1 and C1 are COMET standard capacitors

The DUT meet the specifications as listed in **Tables 1 and 2.**

Specifications	
Capacity C_{max} (nominal)	79 pF
Capacity C_{min} (nominal)	69 pF
Voltage (Peak Test U_{pt} / Peak Working U_{pw})	30 kV / 18 kV
Max. Current Imax at 13.56 MHz with	85 Arms
Conduction Cooling	20 W
Capacitance per	3 pF/turn
Net Weight	0.6 kg

Table 1: Specs of CTMN-74DAC/30-VK

Specifications	
Capacity C_{max} (nominal)	76 pF
Capacity C_{min} (nominal)	66 pF
Voltage (Peak Test U_{pt} / Peak Working U_{pw})	15 kV / 9 kV
Max. Current Imax at 13.56 MHz with	41 Arms
Conduction Cooling	20 W
Capacitance per turn	3 pF/turn
Net Weight	0.44 kg

Table 2: Specs of CTMN-71CAC/15-VK

Appendix

Item	Value
Frequency range	1 - 200Hz
Spectrum (ASD)	1Hz, 0.0001g²/Hz
	4Hz, 0.01g²/Hz
	100Hz, 0.01g²/Hz
	200Hz, 0.001g²/Hz
Total acceleration	1.15g RMS
Test Duration	30 min. vertical
	2 x 10 min. horizontal

Table A1: Parameter of the ISTA-Test 1

Item	Value
Frequency range	2 - 200Hz
Spectrum (ASD)	1Hz, 0.0001g²/Hz
	4Hz, 0.01g²/Hz
	100Hz, 0.01g²/Hz
	200Hz, 0.001g²/Hz
Total acceleration	2.28g RMS
Test Duration	30 min. vertical
	2 x 10 min. horizontal

Table A2: Parameters of the first additional Vibration beyond ISTA-Specs with double load

Item	Value
Frequency range	5 - 200Hz
Spectrum (ASD)	1Hz, 0.0001g²/Hz
	4Hz, 0.01g²/Hz
	100Hz, 0.01g²/Hz
	200Hz, 0.001g²/Hz
Total acceleration	4.56g RMS
Test Duration	1 x 10 min. horizontal (Y)

Table A3: Parameters of the first additional Vibration beyond ISTA-Specs with four times load

Led by experience. Driven by curiosity.

Switzerland (Head Office)
Comet AG
Flamatt

United States
Comet Technologies USA, Inc.
San Jose/CA

China
Comet Mechanical Equipment Co. Ltd.
Shanghai

Germany
YXLON International GmbH
Aachen

Korea (South)
Comet Technologies Korea Co., Ltd
Suwon-si

Malaysia
Comet Technologies Malaysia Sdn Bhd
Penang

Web pct.comet.tech

E-mail pct@comet.tech