

ENGINEERING PRACTICE STUDY

TITLE: CAPACITANCE MEASUREMENT REQUIREMENTS FOR
CLASS II CERAMIC CAPACITORS IN [MIL-PRF-55681](#)

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FINAL REPORT

Study Conducted by DLA Land and Maritime

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I. OBJECTIVE: An engineering practices study has been conducted to solicit feedback from ceramic capacitor manufacturers and users regarding the capacitance measurement requirements for Class II ceramic capacitors in [MIL-PRF-55681](#) (Capacitor, Chip, Multiple Layer, Fixed Ceramic Dielectric, Established Reliability and Non-Established Reliability, General Specification for).

II. BACKGROUND: It has been brought to our attention that there is a discrepancy between the capacitance measurement requirements in [MIL-PRF-55681](#) and [MIL-PRF-32535](#) (Capacitor, Chip, Fixed, Ceramic Dielectric (Temperature Stable and General Purpose), Extended Range, High Reliability and Standard Reliability, General Specification for) for 100 pF Class II capacitors.

The capacitance measurement requirement in [MIL-PRF-55681](#) is as follows:

4.8.4 Capacitance (see 3.7) (for high frequency styles, see 3.1). Capacitors shall be tested in accordance with MIL-STD-202-305. The following details and exception shall apply:

a. Test frequency: 1 MHz $\pm$ 50 kHz (for all BP and BG characteristic capacitors $\leq$ 1,000 pF, and for all BX characteristic capacitors $\leq$ 100 pF); or 1 kHz $\pm$ 50 Hz for all other capacitors.

b. Test voltage: 1.0 volt $\pm$ 0.2 volt rms.

The capacitance measurement requirement in [MIL-PRF-32535](#) is as follows:

4.6.6 Capacitance (see 3.10). Capacitors shall be tested in accordance with MIL-STD-202-305. The following details and exceptions shall apply:

a. Test frequency:

Test frequency	Characteristic	
	Class I	Class II
1 MHz $\pm$ 100 kHz	< 1,000 pF	< 100 pF
1 kHz $\pm$ 100 Hz	$\geq$ 1,000 pF	$\geq$ 100 pF and $\leq$ 10 μ F
120 Hz $\pm$ 10 Hz	N/A	>10 μ F

b. Voltage: A root-mean-square potential of 1.0 $\pm$ 0.2 volt for 1MHz and 1kHz and 0.5 $\pm$ 0.1 volt for 120Hz.

Notice that the test frequency for measuring capacitance on a 100 pF Class II capacitor in [MIL-PRF-55681](#) is 1 MHz $\pm$ 50 kHz; whereas, the test frequency for measuring capacitance on a 100 pF Class II capacitor in [MIL-PRF-32535](#) is 1 kHz $\pm$ 100 Hz. The requirement in [MIL-PRF-123](#) (Capacitor, Fixed, Ceramic Dielectric (Temperature Stable and General Purpose), High Reliability, General Specification for) matches that in [MIL-PRF-55681](#); however, method 101 of [ECIA EIA-198-2](#) (Ceramic Dielectric Capacitors Classes I, II, III, and IV Part II: Test Methods) specifies 1 kHz for all Class II ceramic capacitors.

There has been a request from a [MIL-PRF-55681](#) qualified manufacturer to review the above discrepancy and consider revising [MIL-PRF-55681](#) to align the capacitance measurement requirement with that in [MIL-PRF-32535](#).

III. RESULTS: A review of the [MIL-PRF-32535](#) coordination meeting minutes revealed that the discrepancy between [MIL-PRF-55681](#) and [MIL-PRF-32535](#) was most likely due to a typo. Base on this information, DLA Land and Maritime recommended that the test frequency in [MIL-PRF-55681](#) remain as is. Further discussion of this topic during the January 2023 CE11 Component Parts Committee meeting in San Antonio, TX led to a compromise. The Committee agreed that adding a footnote to [MIL-PRF-55681](#) allowing the manufacturer to measure the capacitance of a 100 pF class II part at either 1 MHz or 1 kHz would be acceptable.

IV. CONCLUSIONS: Military and industry representatives agree that measuring the capacitance of a 100 pF class II part at either 1 MHz or 1 kHz is acceptable..

V. RECOMMENDATIONS: DLA Land and Maritime will revise [MIL-PRF-55681](#) to add a footnote allowing the manufacturer to measure the capacitance of a 100 pF class II part at either 1 MHz or 1 kHz. In addition, [MIL-PRF-32535](#) will be updated with a similar footnote as part of revision B (in progress).