Dynamic Charge-Discharge Performance Test Solution for Capacitive Materials Based on DAQ Systems

All-in-One DAQ Solutions at Doewe Technologies

Doewe Technologies Application Notes-043-V1.0

https://www.doewe.com

1. Introduction

2. Capacitive Materials Overview

3. Specific Test Solution

To address the above materials with capacitive properties, our company has introduced a test solution based on a DAQ system and an arbitrary waveform generator, which can effectively test the charge-discharge performance of different types of materials.

3.1 Test System Setup

First, connect the arbitrary waveform generator to the material under test (MUT) in parallel. The arbitrary waveform generator outputs varying excitation signals through a BNC interface, and alligator clips can be used during connection to ensure a secure connection. The signal source provides multiple waveforms to simulate the charge-discharge process of the material under different working environments.

Next, connect the data acquisition (DAQ) system. To measure voltage and current, connect the voltage measurement port of the DAQ system in parallel with the MUT. The voltage port uses a male banana plug connector to accurately record voltage changes across the material. The current measurement port is connected in series with the MUT, and the current port uses a female banana jack connector to ensure precise capture of current signals during the charge-discharge process.

Through this connection method, the test system can simultaneously acquire voltage and current signals, thereby comprehensively evaluating the dynamic charge-discharge performance of the material. Ensuring stable signal transmission and accurate data acquisition are key elements in the test system design. The block diagram of the test system principle is as follows:

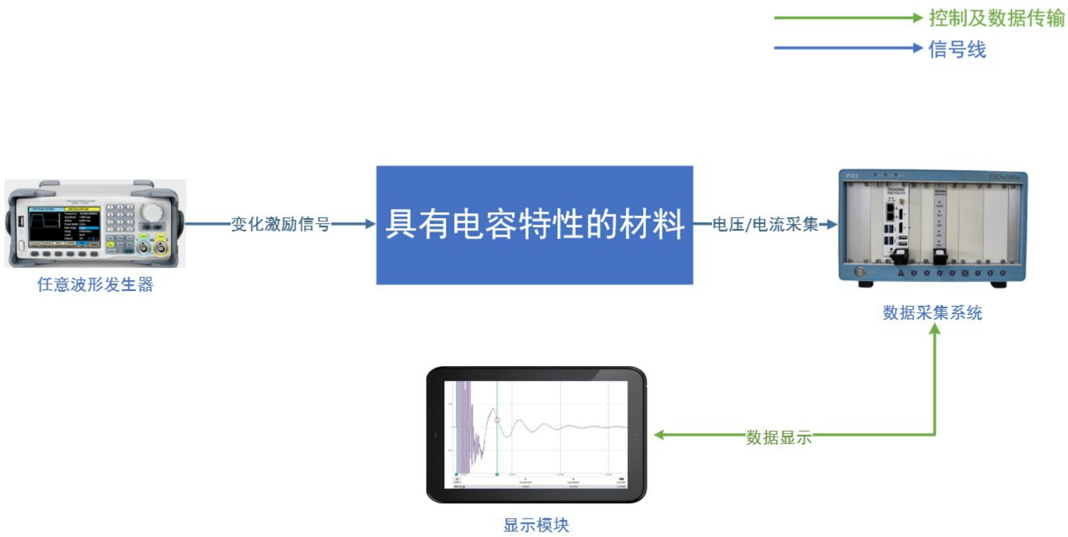

Figure 1 Test Principle Block Diagram

3.2 Test Method

3.3 Test Solution Analysis

4. Introduction to Core Test Equipment

4.1 Arbitrary Waveform Generator

4.2 Data Acquisition (DAQ) System

The DAQ system is the core equipment of this test solution, responsible for real-time acquisition and recording of current and voltage signals generated during the testing process. This system is equipped with high-precision two-channel current signal acquisition and two-channel voltage signal acquisition functions. The sampling rate reaches 2 MS/s, and the bandwidth covers DC to 300 kHz, ensuring the ability to capture subtle current changes during the dynamic charge-discharge process of the material. The system uses 4mm isolated banana plug interfaces to ensure stable signal transmission and reduce noise interference.

The measurement range of one current channel is 0.4 A_{RMS}, suitable for capturing low-current signals, while the measurement range of the other channel is 2 A_{RMS}, capable of handling larger current signals. This dual-channel design enables the DAQ system to adapt to test requirements across different current ranges, providing broader application scenarios.

The sampling rate of the two voltage acquisition channels is also 2 MS/s. The input range for both is 5 V_{RMS} (±10 V_{PEAK}), with a bandwidth of DC to 300 kHz. The measurement range of the voltage acquisition system is 300 V CAT III / 600 V CAT II, supporting accurate measurement in high-voltage environments and ensuring reliable data even in high-voltage testing. These voltage channels use 4mm isolated male banana plug interfaces, providing stable connections and signal acquisition.

Furthermore, the accompanying DAQ software allows users to view test conditions in real-time during experiments and save/export test data through the software interface. This software not only supports data visualization but also allows exporting test results as needed, facilitating subsequent data processing and analysis.

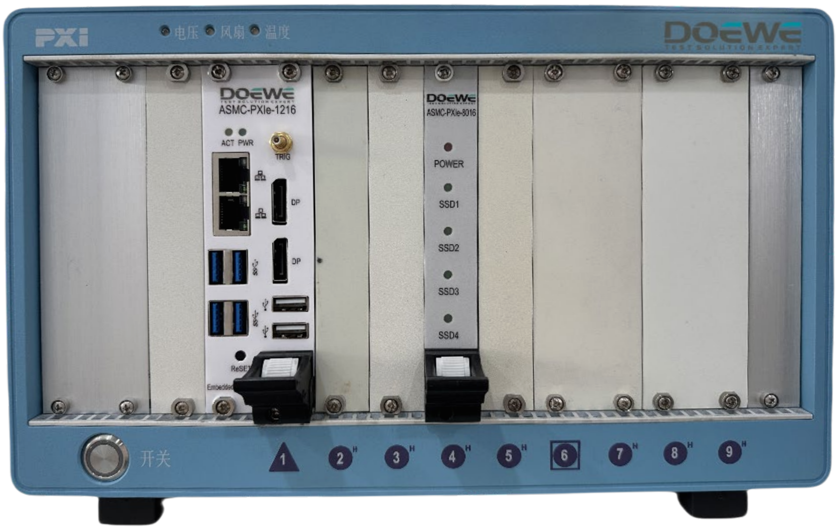

Figure 2 Data Acquisition System

5. Conclusion

The dynamic charge-discharge characteristic test solution for capacitive materials based on a DAQ system proposed by Doewe Technologies can accurately simulate the charge-discharge behavior of materials under changing amplitude and frequency conditions, thereby comprehensively evaluating their capacitive performance. Through the implementation of this solution, the charge-discharge characteristics of materials can be deeply understood in variable working environments, particularly under the influence of different signal amplitudes and frequencies. This provides reliable data support for material design optimization, performance enhancement, and application.

Figure 3 Data Acquisition Module

Doewe Technologies is always committed to achieving innovative, unique, and reliable product solutions in the field of data acquisition. We deeply understand that these elements are the cornerstone for enterprises to establish themselves in market competition. Precisely for this reason, our inspiration for innovation comes from the real application needs of customers, not merely to showcase flashy product features. By continuously optimizing and enhancing data acquisition solutions, Doewe Technologies empowers partners to move towards an efficient and precise future. Welcome to choose Doewe Technologies to jointly open a new chapter in data acquisition. Contact phone: **010-64327909**.