AZERBAIJAN TECHNOLOGIES

Calibration and Test Procedures for Partial Discharge Measurements

Contents

1 Calibration

The purpose of the calibration is to verify that the measuring system will be able to measure the specified PD magnitude correctly.

As discussed previously, when a PD occurs, a current pulse which contains a broad frequency range will be generated. Only a portion of the energy content of each PD pulse reaches the coupling capacitor. Some of the content circulates through the stray capacitance of the system, as illustrated in Figure 1, and therefore, is not available at the sensor.

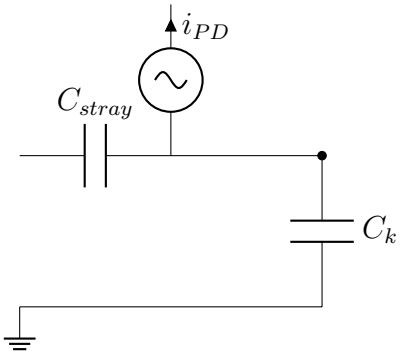

Figure 1: Schematic of the propagation of a PD pulse

The calibration process is carried out before the actual PD measurement and is done by injecting short-duration current pulses of known charge magnitude, across the terminals of the test object. A scale/calibration factor, also called **k-factor**, is calculated by the software of the PD instrument:

$$k = \frac{\text{Injected charge}}{\text{Measured charge}}$$

This k-factor is valid only for a specific test object, frequency range, setup, and instrument. If any of these parameters are modified, the calibration must be repeated. Figure 2 shows a simplified schematic of a setup used for calibration.

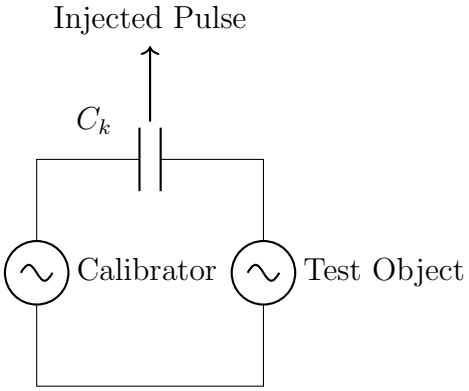

Figure 2: Circuit schematic of a calibration

The instrument used to inject artificial PD pulses is called a **calibrator**. During calibration, it must be connected as close as possible to the terminals of the test object. The

magnitude of the injected pulses must be between 50% and 200% of the specified PD magnitude expected during the test.

It is also recommended that the magnitude of the injected pulses be at least twice the background noise level, as illustrated in Figure 3.

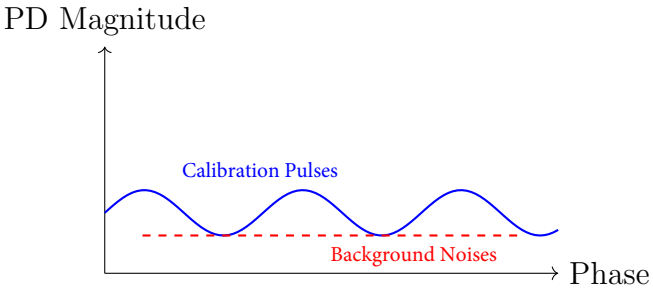

Figure 3: PRPD diagram of calibration pulses in comparison to background noise

Note: The calibration process of the test circuit should not be confused with the calibration of the instrument. The latter must be done periodically on the calibrator or PD acquisition unit to ensure it meets the required accuracy and specifications.

2 Typical Test Procedure

IEC 60270 does not provide a specific test procedure. Instead, procedures are usually defined by the testing specifications or by relevant technical committees for a specific test object.

A typical test procedure defines:

- Test voltage levels and frequency
- Sequence and duration of voltage application
- Pass/fail criteria

These criteria may include:

- Partial Discharge Inception Voltage (PDIV)
- Partial Discharge Extinction Voltage (PDEV)

PD Inception Voltage (PDIV): The lowest voltage at which PD is first observed during voltage increase.

PD Extinction Voltage (PDEV): The voltage at which PD ceases as voltage is reduced from a higher level.

Pre-Stressing

Usually, the voltage is raised above the PD test level and held (pre-stressing), then decreased to the test voltage level and held for measurement. Figure 4 shows this sequence.

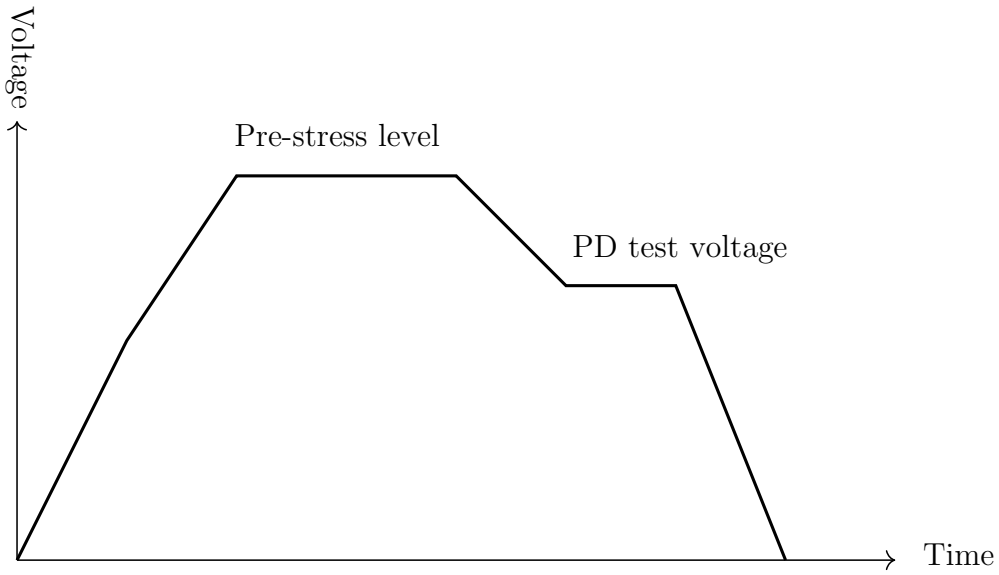

Figure 4: Typical test sequence with pre-stressing