Documentation for Transformer Inrush Currents

Date: 30. April 2026

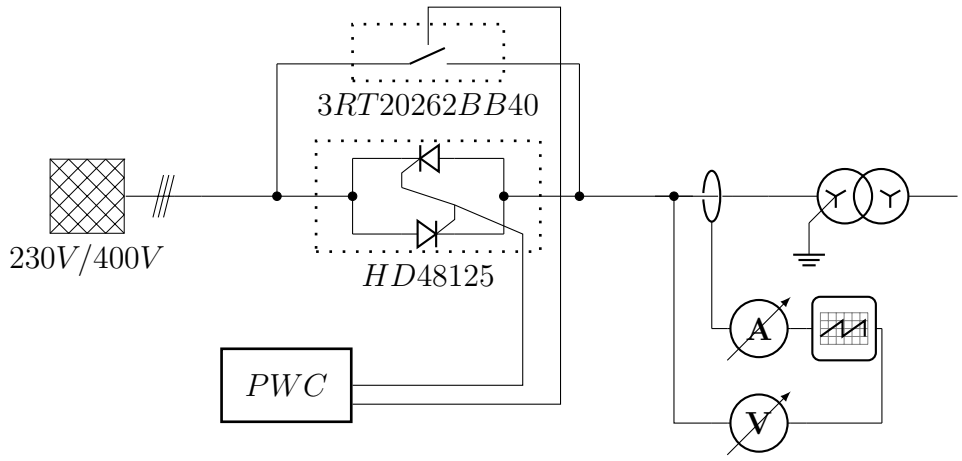
1 Abstract

This dataset contains high resolution measurements of Inrush Currents for a low voltage to medium voltage transformer. The measurements were conducted to confirm a first of a kind inrush mitigation for transformers when switching on the low voltage side. This feature is needed to conduct further research in this field.

2 Device Under Test (Transformer Data)

- $S_n = 50$ kVA
- $f_n = 50$ Hz
- Vector Group: Yyn0 (in the test only the low voltage side is grounded)
- $u_k = 5\%$
- $U_{nLV} = 400$ V (Line to Line Voltage)
- $U_{nHV} = 21$ kV (Line to Line Voltage)
- 3-limp Transformer design
- Core Material: Thyssen Krupp ORIS (min. saturation inductance 1.746 T for Limb and Yoke)

3 Wiring Diagram



To achieve perfect timing during turn on a Thyristor module is used. The turn on time is almost instant and the current can flow. However a thyristor can only break the current when it crosses the 0 line. For low currents an arc created in power contactors cuts

off suddenly which is a physical effect. To guarantee this a power contactor is wired in parallel to the thyristor module. About 50 ms after turn on the power contactor short circuits the thyristor module and the current flows through the power contactor. This guarantees a physically realistic behaviour when turning of the transformer. The signals to turn on or off the devices are calculated and provided by the point on wave controller. The controller provides a pulse of 100 ms to turn on or off the devices. This pulse is converted into a constant on or off signal with the help of a small PCB where the thyristor switch and the power contactor are connected.

- Thyristor Module Crydom HD48125
- Power Contactor Siemens 3RT20262BB40
- Point on Wave Controller (PWC) Schneider Electric RPH2-2SIA3

4 Measurement Devices

4.1 Data Logger

A Data Logger from Dewetron was used

- Type: PUREC 200
- Inputs 16 with 100 kHz resolution
- Input types: -10 V to 10 V Voltage inputs

4.2 Current

The Current was measured with Closed loop Fluxgate Sensors

- Type: LEM IN 400-S
- Ratio: 74.6 A/V
- DataLogger: Input -10 V to 10 V with 10 kHz low pass Filter

4.3 Voltage

The voltages were measured with voltage dividers

- Type: Dewetron MSI2-V-600
- Ratio: Automatically configured withing DataLogger
- DataLogger: Input -10 V to 10 V with 20 kHz low pass Filter

5 Data Structure

The data is provided in .csv format, one turn on event and the corresponding turn off event are provided. The core wasn't specifically demagnetised before this trial was carried out. The first row in the csv defines the channels.

- Filename: inrush_transformer.csv
- Decimal separator: .
- CSV delimiter: ,
- Column 1: Time Vector
- Column 2-4: Voltages U_{L1},U_{L2},U_{L3}
- Column 5-7: Currents I_{L1},I_{L2},I_{L3}

6 Configuration of PWC

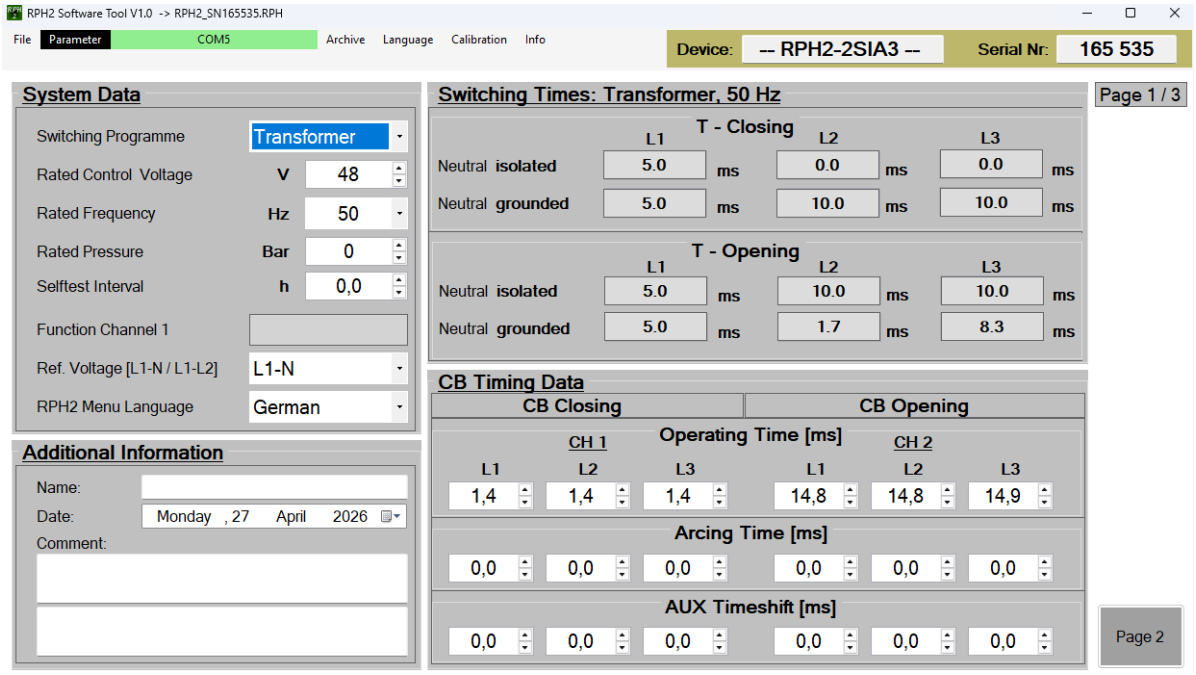


Abbildung 1: Configuration of Point on Wave Controller