Test bench for
Circuit breaker testing

Measurement of the thermal and magnetic tripping characteristic of circuit breakers
AC and DC types

The relating standards:
EN60947-1
VDE0660-100
EN60898-2

Test bench for DC circuit breakers

The test bench is available as 100% turnkey solution for AC circuit breakers as well as for DC circuit breakers.
THE FUNCTIONAL PRINCIPLE:

Options and Add-ons:

- Multi-channel adaptation – reduction of machine setup time
- Redundant safety system with keylock and password protection including signalling lights for advanced personal safety
- Additional database software connector for centralized data storage
CURRENT AMPLIFIER ESN SERIES (thermal and magnetic testing):

The ESN series current amplifiers have a very low harmonic distortion (typically <0.5%) and frequency ranges 45Hz-65Hz / 15Hz-150Hz / 45Hz-450Hz /DC. The specified continuous power relates to the requirements of the thermal testing. The available short-time power capability (for the magnetic tripping characteristic testing) is 3-times the continuous power of the ESN series. As an option the short-time power capability can be extended to 6.5 times of the amplifiers continuous power.

The ESN amplifier series has various continuous power ranges:

- 100VA
- 200VA
- 400VA
- 500VA
- 700VA
- 1000VA
- 1500VA
- 3000VA
- 4500VA
- 5000VA
- 6000VA
- 7500VA
- 9000VA
- 15000VA
- 30000VA

**Possible current-/voltage combinations**

**ESN 1500:**
- 5A/600V
- 20A/160V
- 80A/40V
- 260A/12V
- 650A/9V
- 1300A/4.5V

**ESN 4500:**
- 5A/500V
- 25A/150V
- 50A/75V
- 100A/37V
- 300A/37V
- 500A/22V
- 1000A/22V
- 1600A/14V

CURRENT AMPLIFIER DCS SERIES (thermal testing):

The DCS series offers modular 5000VA power stages, optional parallel connection is available.

A power adjustment unit is available for both amplifier series.
TEST AND EVALUATION SOFTWARE:

Selection of test types

Database driven management of the EUT characteristics
searching and filtering is possible

Test setup for magnetic tests
with the parameters:
- hold current
- duration
- pause current
- duration
- tripping current
- duration

Approach of the magnetic tripping current:
Testing the thermal characteristic:

Long-term testing:

Safety concept with integrated user management:

Screenshots show the German software version, English version is also available.
MEASUREMENT AND CALCULATION OF THE TIME CONSTANT $\tau$ ACC. EN60898-2:

The requirements of the EN60898-2 relating to ripple are 100% according to the standard. The following oscilloscope measurements show the rise- and fall-times between 10% and 90% value of the output signal. The relating time constant can be calculated as follows:

**Calculation:**

\[
\tau = \frac{\text{Risetime}}{\ln(9)}
\]

\[
\tau = \frac{8,7600\,ms}{\ln(9)}
\]

\[
\tau = 3,987\,ms
\]

**Calculation:**

\[
\tau = \frac{8,7500\,ms}{\ln(9)}
\]

\[
\tau = 3,982\,ms
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