

DEHN tests and analyses

DEHN Test Centre



Powerful: Lightning current tests up to 400 kA (10/350 μ s)



DEHN protects.®

Our task is to protect persons, buildings, installations and devices from the risks of lightning strikes and surges. DEHN is an internationally recognised expert and technological leader in the fields of lightning and surge protection. Our portfolio includes surge protection, lightning protection / earthing and safety equipment products and services.

DEHN Test Centre

Our test centre with a floor space of 800 m² is equipped with the latest devices and technologies. This allows us to perform lightning current tests on products, installations and systems. In the lightning current laboratory which is part of the DEHN test centre, protective functions can be realistically tested with lightning currents up to 400 kA (10/350 µs).

The DEHN test centre allows to test the lightning current withstand capability of our customers installations and systems. It is also essential for the successful development of new lightning and surge protection products and concepts.

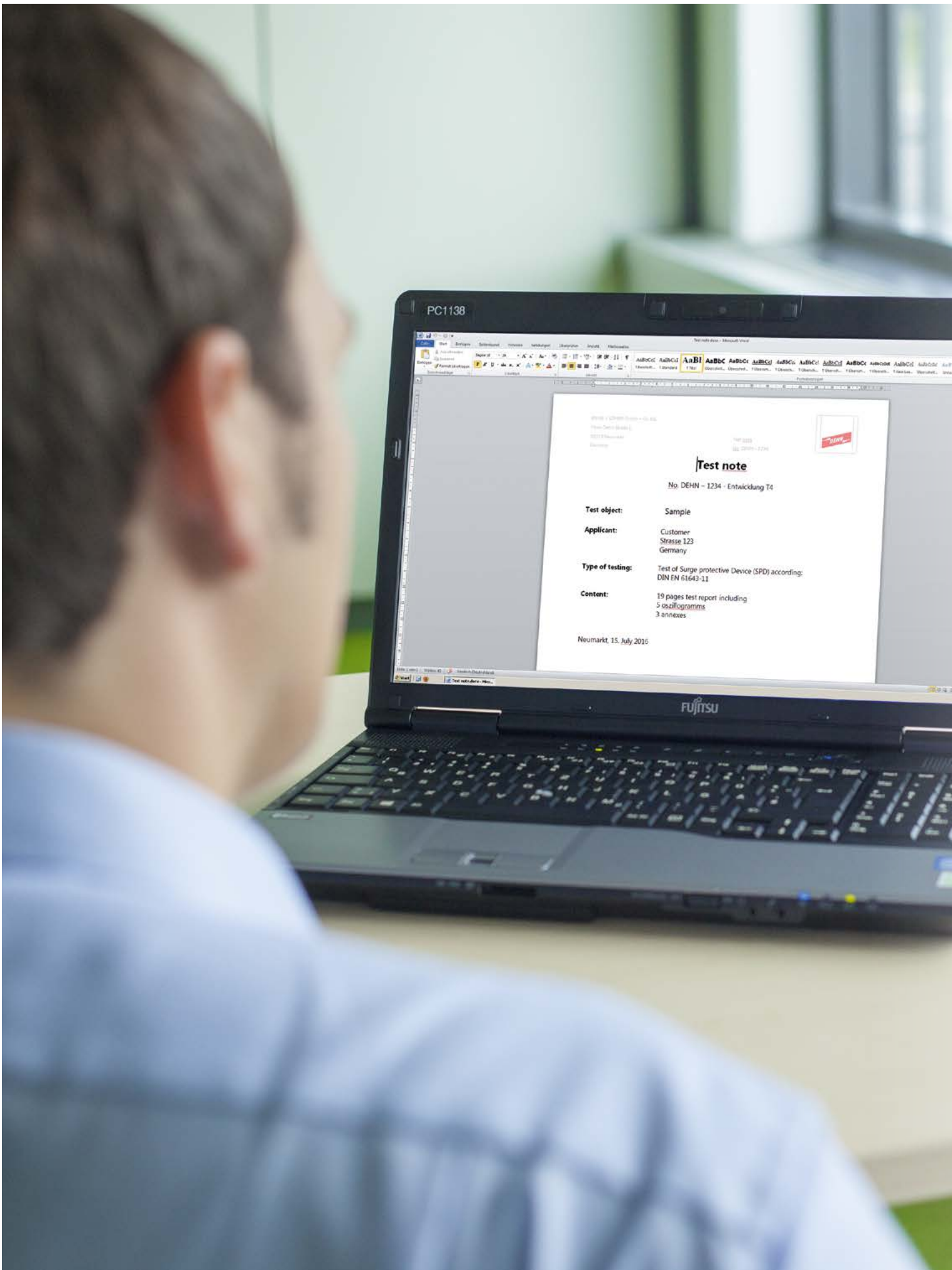
Thanks to their active involvement with international and national standardisation committees, DEHN employees always have in-depth and up-to-date knowledge of standards and their technological basics. Of course the tests performed in our test centre are based on the relevant standards.

Services of the DEHN Test Centre:

- Test of surge protective devices (SPDs) according to IEC 61643-11, IEC 61643-21 and UL 1449
- Test of surge protective devices (SPDs) used in photovoltaic systems according to EN 50539-11
- Test of external lightning protection components according to IEC 62561
- High-voltage test with lightning impulses according to IEC 60060-1
- Complete lightning current tests for low-voltage distribution boards according to IEC 62305-1, IEC 62305-4 and IEC 61643-12
- Surge immunity test according to IEC 61000-4-5
- Surge immunity test for telecommunication systems according to ITU-T* and CCITT**
- Lightning current tests for wind turbines, photovoltaic systems and cell sites according to IEC 62305-1 and IEC 61400-24
- Functional test for low-voltage switchgear installations according to IEC 60947
- Other test services are available on request

* ITU-T: Telecommunication Standardisation Sector, a unit of the International Telecommunication Union (ITU)

** CCITT: The Comité Consultatif International Téléphonique et Télégraphique is a technical committee of the ITU





Test services for our customers

For all industries

Is your electrical installation protected by an application-specific solution? No problem! We test the lightning current withstand capability of your installation and systems and prepare a detailed test report. Special solutions for lightning and surge protection systems can also be tested and analysed in our test centre. Our customers are leading companies in the wind energy, photovoltaic, mobile phone and railway industry, and also consultants and switchgear manufacturers.

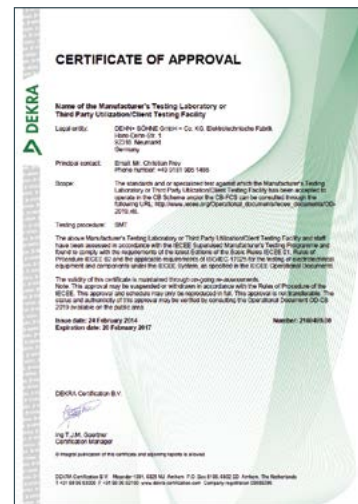


Detailed documentation

Test results, computer simulations and field measurements are summarised in a detailed test report. All results are provided to the customer. Our employees will be pleased to give detailed information about tests and standards.

Tested and safe

Our customers can trust that our tests are safe since the DEHN test centre is regularly tested according to IEC/ISO 17025 by renowned approval authorities.





Up to 400 kA (10/350 μ s)

Lightning impulse current generators

The extremely high lightning currents, which may arise in case of direct lightning strikes, are the primary source of lightning damage to structures. Therefore, it is essential to verify the effectiveness of protection measures in lightning current tests to ensure efficient lightning protection. Our new testing facility generates extremely high lightning currents up to 400 kA (10/350 μ s). This allows us to test lightning protection systems for installations requiring maximum protection.

Performance parameters:

- Up to 400 kA (10/350 μ s)

Applications:

- Test of the components of wind turbines, cell sites and photovoltaic systems according to IEC 62305 and IEC 61400-24
- Test of SPDs according to IEC 61643
- Test of external lightning protection components according to IEC 62561
- Lightning current test for low-voltage switchgear installations according to IEC 62305

Impulse current generators

Our impulse current generators generate impulse currents to simulate indirect lightning effects and switching operations.

Performance parameters:

- Up to 200 kA (8/20 μ s)

Applications:

- Test of SPDs according to IEC 61643 and UL 1449
- Test of the electronic components of cell sites, photovoltaic systems and wind turbines according to IEC 62305 and IEC 61400-24



Impulse current generators

Our impulse current generators simulate the voltage load on insulating clearances under lightning effects.

Performance parameters:

- Charge voltage up to 500 kV
- Lightning impulse voltage (1.2/50 μ s)
- Switching impulse voltage (250/2500 μ s)

Applications:

- High-voltage test with lightning impulse voltages or switching impulse voltages according to IEC 60060-1

Hybrid and impulse current generators

Hybrid generators allow to verify the surge immunity which is required for EMC tests of electronic devices. Impulse current generators are used to test telecommunications equipment according to e.g. the requirements of the International Telecommunication Union (ITU).

Performance parameters:

- Up to 30 kV (1.2/50 μ s) / 25 kA (8/20 μ s)
- Up to 6 kV (10/700 μ s) / 240 kA (10/350 μ s)
- Up to 1 kV (10/1000 μ s) / 10 kA (10/1000 μ s)

Applications:

- Surge immunity test according to IEC 6100-4-5
- Surge immunity test for telecommunication lines according to ITU-T* and CCITT**
- Test of SPDs according to IEC 61643 and UL 1449

* ITU-T: Telecommunication Standardisation Sector, a unit of the International Telecommunication Union (ITU)

** CCITT: The Comité Consultatif International Téléphonique et Télégraphique is a technical committee of the ITU



Follow current transformer for a.c. applications

In combination with a 100 kA (8/20 μ s) impulse current generator, the powerful single-phase transformer allows to perform work cycle tests for SPDs of a.c. systems.

Performance parameters:

- Single-phase, 1400 kVA, 50 Hz
- Maximum voltage of 1200 V_{rms}
- Maximum short-circuit current of 50 kA_{rms}

Applications:

- Test of SPDs according to IEC 61643 and UL 1449
- Work cycle tests for SPDs of a.c. systems

Power current source for d.c. applications

The powerful d.c. generator consists of a three-phase transformer with a B6 bridge rectifier. In combination with a 50 kA (8/20 μ s) impulse current generator, work cycle tests for SPDs of d.c. systems can be performed.

Performance parameters:

- Three-phase 520 kVA and B6 bridge rectifier
- Categories DC 20 to DC 22 according to IEC 60947
- Test voltages up to 1500 V
- Continuous current of 300 A
- Short-time current of 5000 A / 25 ms

Applications:

- Test of SPDs for use in d.c. and PV systems according to EN 50539-11
- Work cycle tests for SPDs of d.c. systems



Photovoltaic simulator

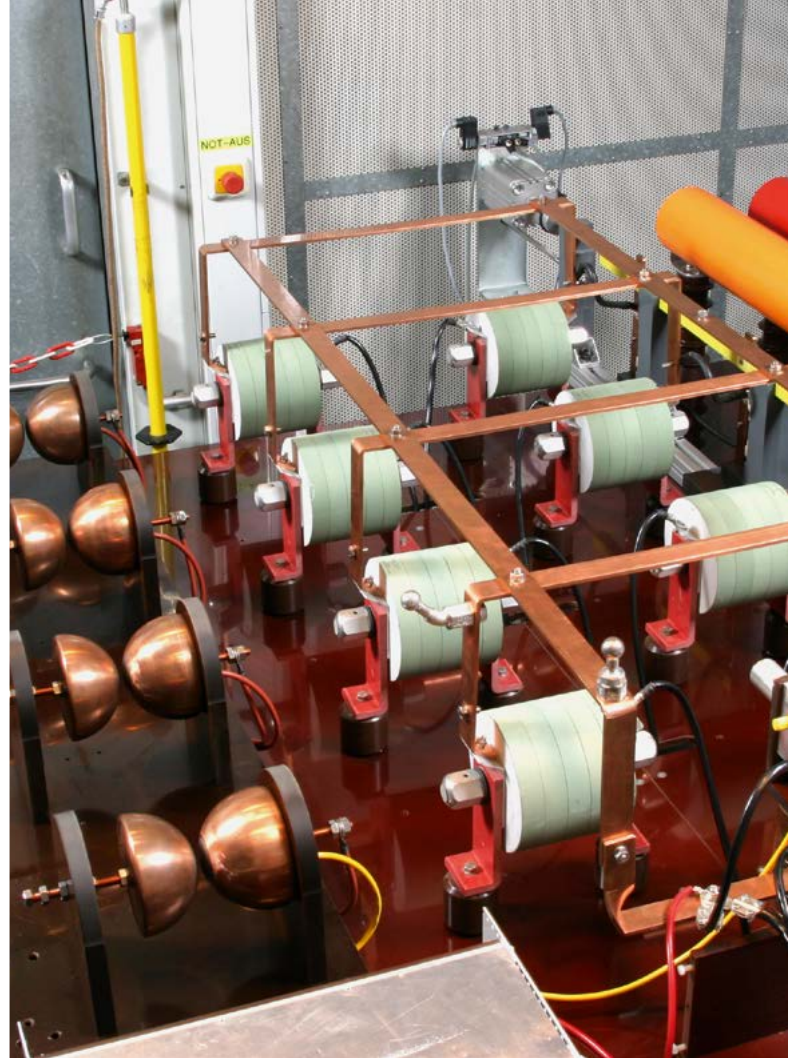
The laboratory simulation of the equivalent circuit of a loaded solar cell consists of a parallel connection of diodes and an ideal current source. The open-circuit voltage can be set via a variety of single diodes which are connected in series. A fast constant current controller simulates an ideal current source for a sufficiently long period of time. This proven concept is suited to dynamically simulate the non-linear i/u characteristic of a PV generator.

Performance parameters:

- $U_{oc} = 1500 \text{ V}$, $I_{sc} = 100 \text{ A}$, $P = 150 \text{ kW}_p$

Applications:

- Test of SPDs used in PV systems according to EN 50539-11
- Test of switching devices and fuses used on the d.c. side of PV systems



Multiple impulse current generator

According to IEC 62305-1, a multiple stroke on average consists of three to four strokes. The typical time intervals between them are about 50 ms. A multiple impulse current generator allows to simulate such multiple strokes in the laboratory.

Performance parameters:

- Multiple impulse current discharges up to $4 \times 25 \text{ kA}$ (8/20 μs)

Applications:

- Test of SPDs and lightning protection components





Computer simulations, modelling and field measurements

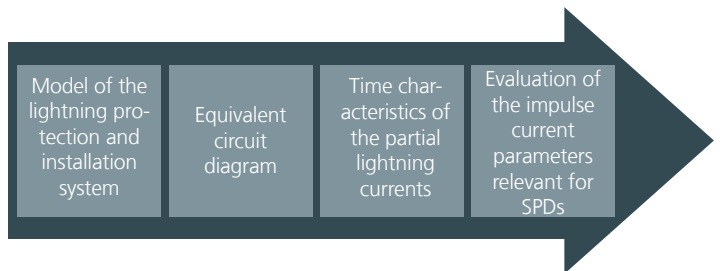
Computer simulation

Computer simulations make it easier to exactly determine the transient current and voltage distribution for complex installations. With this method, the time characteristic of the partial lightning currents can be displayed in an equivalent circuit diagram using SPICE network analysis software. This allows to efficiently select protective devices in technically and economically optimal way.

Modelling

The computer models for lightning current distribution developed at DEHN were verified in laboratory tests and with triggered lightning currents at a transmitter mast of the Brazilian lightning research station Cachoeira Paulista. The results of these tests were presented in numerous scientific publications.

The procedure for modelling and calculating the lightning current distribution is also described in supplement 1 of the German DIN EN 62305-4 standard.



Application

This method was successfully used in numerous applications such as in railway, photovoltaic and telecommunication systems.

Current distribution in special structures

Externally arranged equipment and insufficient separation distance

High buildings

PV systems with LPS and insufficient separation distance

Free field PV systems

Power stations

Transformer in a building

Field measurement

Tests on real installations allow to analyse the special operating conditions for protective devices. The DEHN test centre features modern equipment and mobile test generators for such field measurements.

For more detailed information
and enquiries concerning our test services,
please contact:

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www.dehn-international.com/partners



Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.®

DEHN + SÖHNE
GmbH + Co.KG.

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