

Arcing test

Arcing Test:
New Edition IEC/TR 61641



Arcing Test: New Edition IEC/TR 61641

Overview

Terms

Classification

Characteristics

Ignition points

Test report

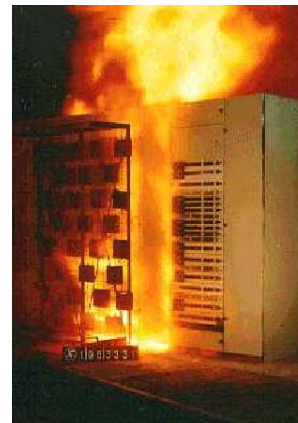
Application area:

“The technical report applies to low-voltage switchgear and controlgear assemblies in closed design in accordance with IEC60439-1

...

This test is a **voluntary test**, either at the discretion of the manufacturer or subject to an agreement between the manufacturer and the user.”

The test is still considered a special test outside the IEC60439-1!



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New adoption of terms, definitions

- Arc

→ This term refers to a short-circuit arising from a fault between active parts of different potential and/or between active parts and other conductive parts resulting in a free burning arc within an ASSEMBLY



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New adoption of terms, definitions

- Arc-free zone

→ This term refers to a part of a circuit within the ASSEMBLY where it is not possible to apply an ignition wire without destroying the insulation material on conductors

e.g. SIVACON S8 insulated busbar



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New adoption of terms, definitions

- Arc-proof zone

→ This term refers to a part of a circuit where an ignition wire can be applied and fulfilling all relevant criteria for the assessment of the test

e.g. SIVACON S8 main busbar
compartment with arc barriers



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New adoption of terms, definitions

- Arc-proof assembly

→ This term refers to a assembly consisting of arc free zones and/or arc proof zones

e.g. SIVACON S8 with arcing-tested modules such as pressure relief flaps and hinge & locking system



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Introduction of abbreviations:

- permissible current under arcing conditions

$I_{p \text{ arc}}$

- Permissible arc duration

t_{arc}

- permissible conditional short-circuit current under arcing conditions

$I_{pc \text{ arc}}$

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New adoption of terms, definitions

- Personnel protection under arcing conditions

- ➔ This term refers to the ability of an ASSEMBLY to limit the risk of personal injury caused by the mechanical and thermal effects of an internal arcing fault

- Assembly protection under arcing conditions

- ➔ This term refers to the ability of an ASSEMBLY to limit the effects of an internal arcing fault on the operation to a defined area inside the ASSEMBLY

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Classification by personnel and assembly protection

- According to their characteristics under arcing conditions, low-voltage switchgear and controlgear assemblies can be classified into:
 1. **Low-voltage switchgear and controlgear assemblies with guaranteed personnel protection.**
 2. **Low-voltage switchgear and controlgear assemblies with guaranteed personnel and assembly protection.**

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Classification by personnel and assembly protection

Assessment criteria for personnel protection (criteria 1-5):

1. Properly secured doors, covers, etc. must not open.
2. Parts (of the switchgear and controlgear assembly) which may cause risks must not fly off.
3. No holes must form in the freely accessible outer parts of the casing due to blowing or other effects as a result of arcing.
4. Vertically attached indicators must not ignite (indicators ignited by burning coats of paint or burning labels are to be excluded from this assessment).
5. The protective conductor circuit for touchable parts of the casing must be functioning.



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Classification by personnel and assembly protection

Assessment criteria for assembly protection (criteria 6-7):

6. The arc must be restricted to a defined zone and no new ignition must take place in the adjoining zones.

Additionally for emergency operation

7. Emergency operation of the switchgear and controlgear assembly must be possible after fault rectification or after disconnection or removal of the affected functional units. This has to be proven by an insulation test with 1.5 times the value of the rated operating voltage over 1 minute.



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Test assessment

Previously:

“ ... The orderer of the test has to decide on the basis of which of these criteria the test results are to be assessed.”

New:

“Personal protection is achieved when these criteria are fulfilled:”

Criteria 1 to 5

&

“Assembly protection is achieved when criteria 1) to 6) are fulfilled:.”

Arcing test: Limitation of Effects

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Classification by personnel and assembly protection

Implementation based on the multi-level concept for
SIVACON power distribution boards

Personnel protection:

level 1: Personnel safety

Personnel and assembly protection:

level 2: Local restriction to a section

level 3*: Local restriction to the functional compartment

level 4*: Restriction to the point of origin

Arc-free zone for increased assembly protection:

Option: Insulated busbars

* (Only FCB, OFFW, OFPD)

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Industry Sector

Arcing test: Limitation of Effects

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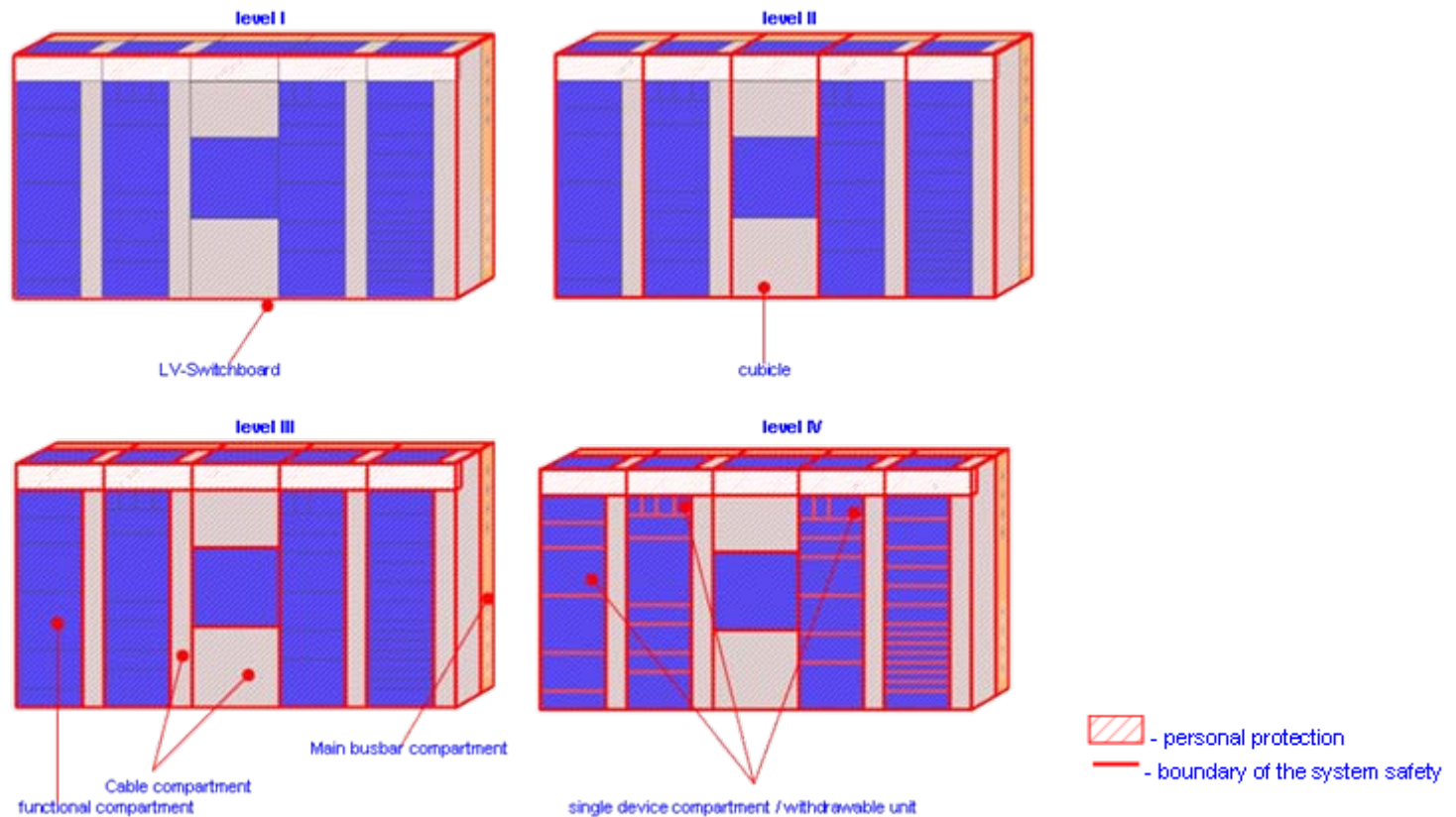
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Classification by personnel and assembly protection

Implementation based on the multi-level concept for SIVACON power distribution boards



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Details on system characteristics under arcing conditions

The following characteristics are to be specified by the manufacturer:

- Permissible prospective short-circuit current under arcing conditions (I_{p_arc}) and the corresponding permissible arcing duration (t_{arc}), or
- Permissible conditional short-circuit current under arcing conditions (I_{pc_arc})
- Characteristics of a short-circuit current-limiting device
- Rated operating voltage (U_e)
- Defined zones to which the arcing effects are restricted with system protection

→ SIVACON: level 2: section; level 3: functional compartment;
level 4: point of origin

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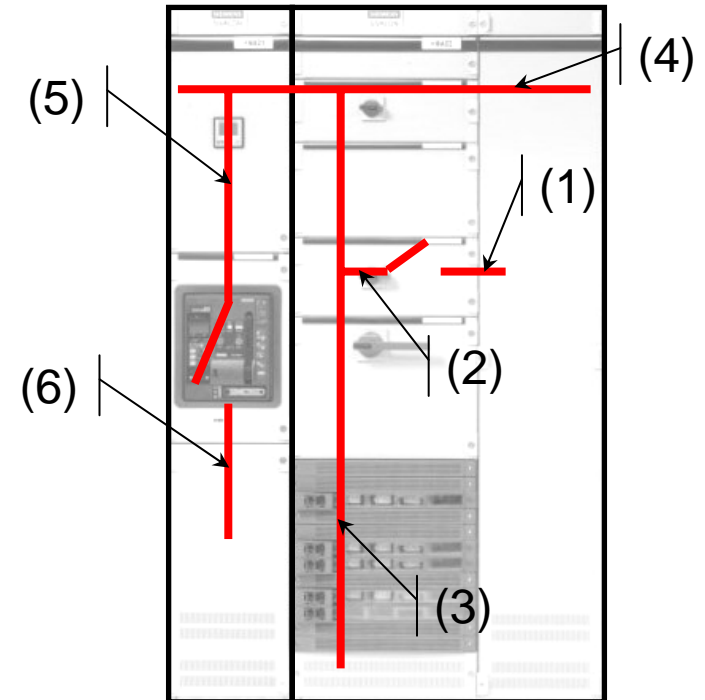
Ignition points

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Test implementation – ignition points

The following ignition points have to be considered in the test:

- (1) Load side of a feeder
- (2) supply side of a feeder
- (3) Along distribution busbars
- (4) Along main busbars
- (5) Load side of an infeed
- (6) supply side of an incoming



No test is required if these ignition points fulfill the criteria of an arcing-free zone. Insulation material must not be destroyed, removed or punctured during attachment of the ignition wire.

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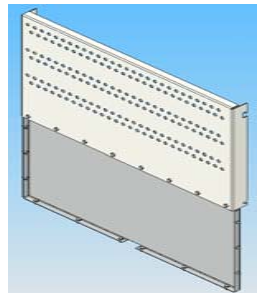
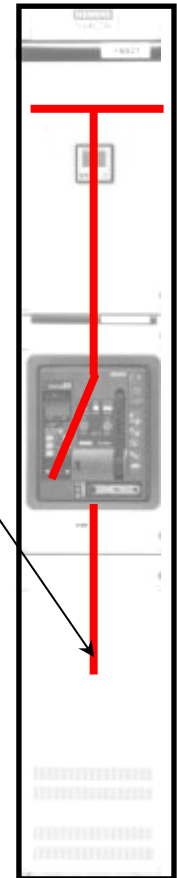
Test implementation – ignition points

Effects exemplified with a circuit breaker section as ignition point (6) on the infeed side of the infeed:

- The ignition point lies behind the door's ventilation holes
- Additional measures are required with certain system characteristics to prevent the discharge of hot gas,

e.g. baffles and/or non-return valves

(6)



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Angaben auf dem Prüfbericht



SIVACON S
Outgoing feeder fixed-mounted and withdrawable (OFFW)
main busbars at the top, ventilated

Tests under conditions of arcing due to an internal fault with a short-circuit current of 50 kA, a test voltage of 725 V and a duration of short-circuit of 300 ms

The criteria of assessment 1 to 5 of DIN EN 60439-1 Bbl 2: 1997-10 and 1 to 7 of E DIN EN 60439-1 Bbl 2: 2001-02 have been met for the following ignition point:

- at the incoming contacts of a plug-in in a plug-in unit of 250 mm height

The effects of the arc remains within the plug-in unit.

The test results are documented in IPH Test Report No. 1496.1339.7.752

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK“ GMBH 

Independent, accredited testing station - Member laboratory of STL and LOVAC

TEST CONFIRMATION on the given range of performed tests

TYPE CLIENT

MANUFACTURER

RANGE OF TESTS PERFORMED TEST OBJECT TYPE

SERIAL NO

RATED CHARACTERISTICS GIVEN BY THE CLIENT

TEST RESULT

NORMATIVE DOCUMENT

RANGE OF TESTS PERFORMED

DATE OF TEST

TEST RESULT

The test results are documented in IPH Test Report No. 1496.1339.7.752

H. GLABSCH
Head of high-power test laboratory
Berlin, 11 February 2008

S. GEORGAS
Test engineer in charge



This documentation shall not be reproduced in extracts without written approval by IPH GmbH.
The test results relate only to the object tested.
Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Techn. (DAkkert) e.V. in the fields of its apparatus and software for power cables and power cable accessories, in apparatus and software, installation equipment and switching and control equipment.



DAT - P - 010/02

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