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MEDDELANDE

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Översänder enligt överenskommelse rapporten på dielektricitetsprovningen vi genomförde i slutet av november. Hoppas allt är till belåtenhet.

Faktura kommer att sändas separat.

Med vänlig hälsning

SP Sveriges Tekniska Forskningsinstitut

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REPORT

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Dielectrical test of a cutting fire extinguisher

Sammanfattning
Strömmen genom strålen till jord på en skärbrandsläckare har uppmätts i enlighet med standard EN-3-7:2004+A1 2007(E), Annex C. Resultaten visar att standardens krav uppfylls då enbart vatten används samt då skärmedel (abrasiv) tillsätts vattnet. När skum tillsätts vattnet, överskrider dock strömmen genom strålen till jord gränsvärdet satt i standarden.

Abstract
The current through the stream of a cutting fire extinguisher has been measured in accordance with the standard EN-3-7:2004+A1 2007(E), Annex C. The results show that the demand in the standard is fulfilled when only water is used and when abrasive is added to the water. When foam is added to the water, the current through the stream to earth is above the limit in the standard.

1 Identification

Object	Cobra cutting fire extinguisher
Test location	Borås
Test date	Nov 26, 2009

2 Background and Commission

The tests were performed in accordance with EN-3-7:2004+A1 2007(E), Annex C. The voltage and current were measured using instrumentation owned and maintained by SP. According to the standard, the current between operator accessed parts (like handle) and earth must not be greater than 0.5 mA when an alternating voltage of 35 kV is applied to a metallic plate, hit by the fire extinguishing fluid and at a distance of one meter from the discharge outlet.

3 Measurement conditions

Indoor temperature:	22.0 ± 3.0 °C	Measuring and data acquisition equipment
Indoor humidity:	40 ± 10 %	
Outdoor temperature:	10.0 ± 5.0 °C	Test setup
Outdoor humidity:	90 ± 10 %	

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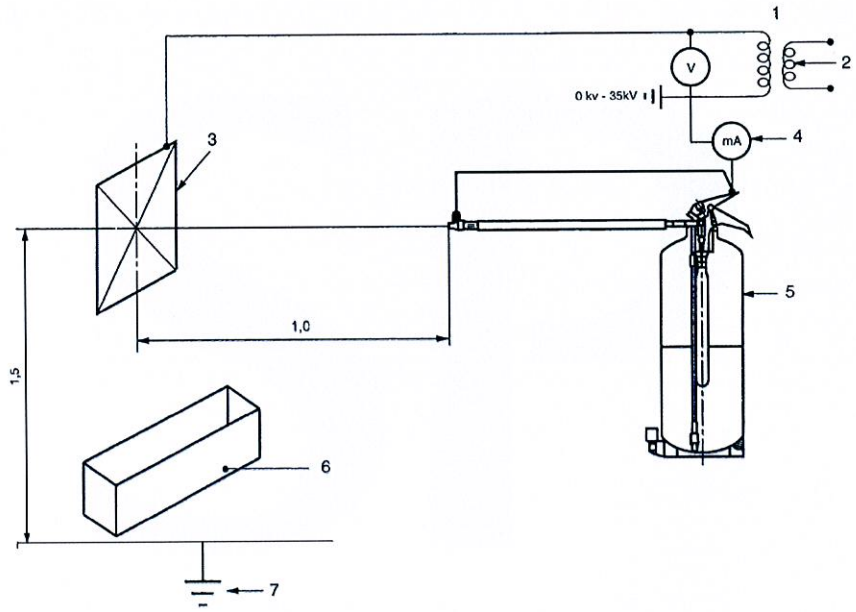
4 Test setup

The equipment was arranged as shown in the picture below.

This was done to fulfil the requirements of the above mentioned standard, see figure 1 below for a schematic description of the setup.



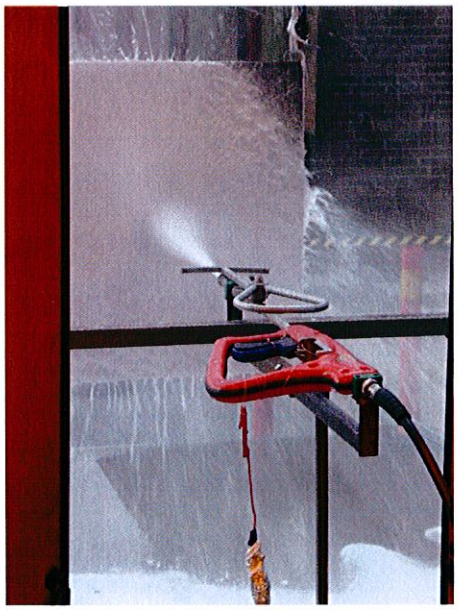
Key

1 Test transformer
2 Low voltage supply
3 Metallic plate
4 Ammeter
5 Extinguisher under test
6 Collecting trough (insulated from earth)
7 Earth

Figure 1- schematic arrangement of test setup (source: figure C.1 p. 28 EN 3-7:2004+A1 2007 (E))

A metallic plate of dimensions 1m x 1m x 6mm was hung vertically by insulators and with no structures closer than 0.5 m above the top and 1 meter in all other directions. An alternating voltage of 35 kV was applied between the plate and earth. The discharge outlet was fixed at a 1 meter's distance so that it was directed towards the centre of the plate.

The nozzle and the handle were connected as can be seen in the picture below. The current to earth was determined using a precision 100 Ω shunt in series with the ground connection. The output of the shunt was connected to a precision multimeter, measuring rms values, via a voltage buffer amplifier. To minimize influence of stray capacitance between high voltage parts and measuring equipment, the current shunt and the amplifier were put in a screened box.



5 Results

Four tests were performed, three with all parameters according to standard and one where the discharge outlet was moved to a distance of 0.5 meters from the plate.

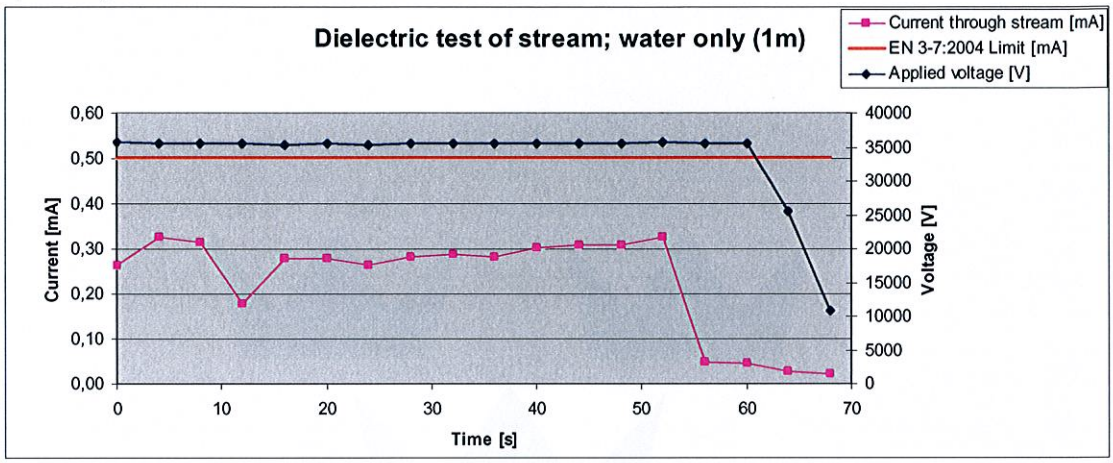
In the table below, the maximum current during tests according to standards are shown.

	Max current [mA]
Water	0,32
Water + foam	8,5
Water + abrasive	0,16

In the figures below the applied voltage can be seen as the round dots, and the current through the stream as the square dots. The solid line shows the maximum current allowed by the standard.

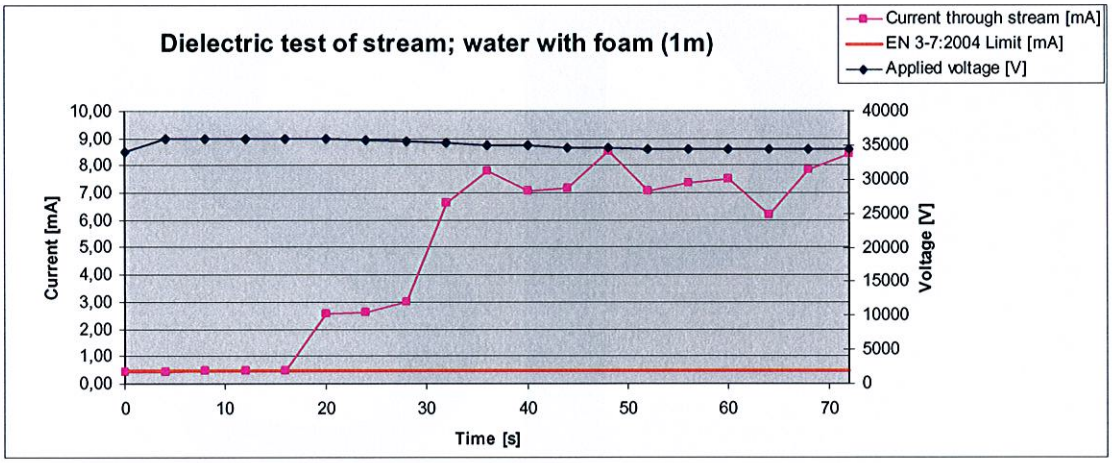
5.1 Test with water

First a test according to standard with only water was performed. The dip in current after approximately 11 seconds is explained by a short puff of abrasive. The maximum current was 0,32 mA, which is under the limit in the standard.



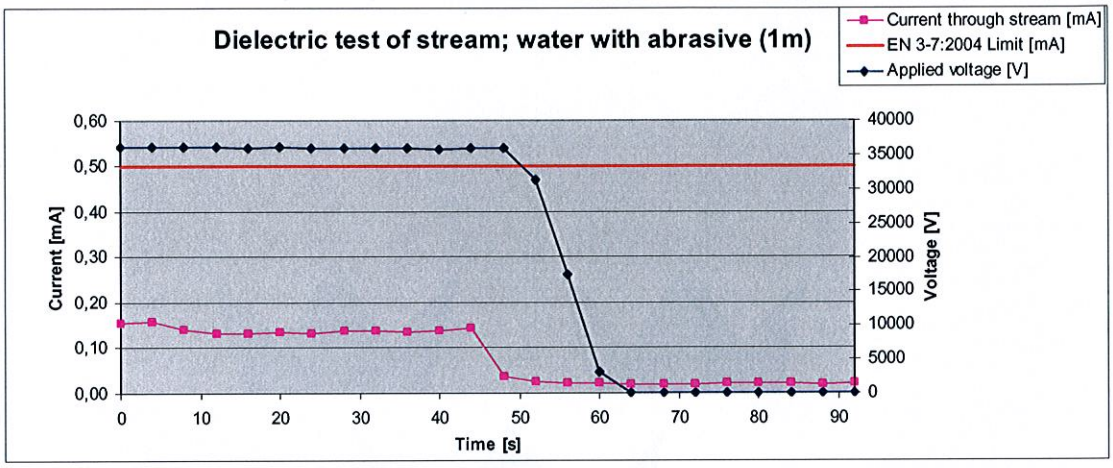
5.2 Test with foam

A test according to standard, where foam was added to the water was performed. The foam was added after approximately 30 seconds. The maximum current was 8,5 mA, which is above the limit in the standard.



5.3 Test with abrasive

A test according to standard, where abrasive was added to the water was performed. The maximum current was 0,16 mA, which is under the limit in the standard.

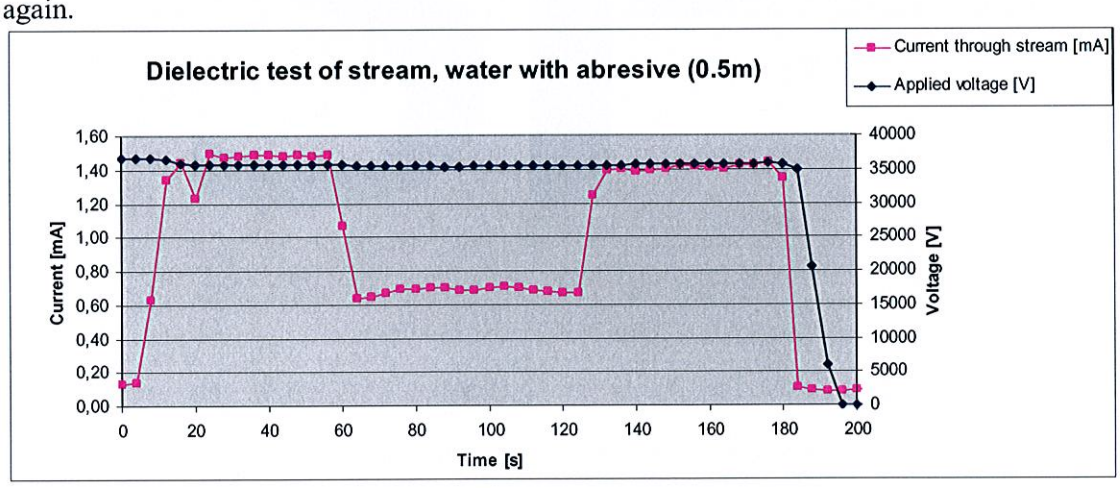


5.4 Test with water/ water + abrasive on a shorter distance

A test where the distance between the output discharge and the plate was 0.5 meters was performed. In the table below, the maximum currents with only water and with water and abrasive are shown.

	Max current [mA]
Water	1,5
Water + abrasive	0,7

In the figure below first only water was used, then abrasive was added and then taken away again.



The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with EA Publication EA-4/02.

The high voltage was applied according to the provisions in IEC 60060-1 (i.e. a maximum deviation of ± 3 % from the nominal voltage).

The high voltage measuring equipment has an uncertainty less than ± 0.15 %. The current measurement equipment is estimated to have an uncertainty better than ± 0.2 %.

6 Traceability

SP is National Laboratory for electrical quantities and time and frequency by appointment of the Swedish government. SP realizes fundamental units such as volt, ohm and second from primary standards. Traceability for other units is established from these realizations by means of in-house calibrations and scientific analyses. To ensure international equivalence and acceptance of the established traceability, interlaboratory comparisons are made between national laboratories.

7 Conclusion

The tested fire extinguisher fulfils the requirements for dielectric test in accordance with EN-3-7:2004+A1 2007(E) Annex C, when water and water with abrasive is used as extinguish fluid. The current limit is exceeded when foam is added to the water.

8 Equipment

SP data acquisition program Read 3 dvm ver. 4.2

Reference measuring system for AC voltage
SP501990, Compressed gas capacitor Haefely NK 300, SP inv.no 501990
SP602797, Low voltage arm 2,5 µF, SP inv.no 602797
SP602894, 7 m coaxial RG213
2 pcs 2 m coaxial cable 50 ohm impedance
SP602525, Multimeter HP 34401, SP inv.no 602525

Current measuring equipment
SP900093, Multimeter HP 3458A, SP inv.no 900093
Precision current shunt Leeds & Northrup 100 Ω s/n: 1683792
Precision voltage buffer amplifier SP inv.no 900177

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