BS EN 50131-8:2009

BSI British Standards

Alarm systems — Intrusion and hold-up systems —

Part 8: Security fog device/systems

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National foreword

This British Standard is the UK implementation of EN 50131-8:2009. It supersedes BS 7939:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GW/1, Electronic security systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 79, Alarm systems.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50131-8 on 2009-04-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-04-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-04-01

The series EN/TS 50131 will consist of the following parts, under the general title "*Alarm systems – Intrusion and hold-up systems*":

Part 1	System requirements
Part 2-2	Intrusion detectors – Passive infrared detectors
Part 2-3	Requirements for microwave detectors
Part 2-4	Requirements for combined passive infrared and microwave detectors
Part 2-5	Requirements for combined passive infrared and ultrasonic detectors
Part 2-6	Opening contacts (magnetic)
Part 2-7-1	Intrusion detectors – Glass break detectors (acoustic)
Part 2-7-2	Intrusion detectors – Glass break detectors (passive)
Part 2-7-3	Intrusion detectors – Glass break detectors (active)
Part 3	Control and indicating equipment
Part 4	Warning devices
Part 5-3	Requirements for interconnections equipment using radio frequency techniques
Part 6	Power supplies
Part 7	Application guidelines
Part 8	Security fog devices/systems

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Introduction

This European Standard applies to a security fog system that is part of an Intruder and Hold-up Alarm System (I&HAS) and is used both as a security deterrent device for building security and as a crime reduction device for the protection of people.

This European Standard is intended to assist insurers, intruder alarm companies, customers and the police in understanding the principles and specification of a security fog system.

The purpose of a security fog system is to reduce the visibility in a protected area by the use of a non-toxic fog in order to form a barrier between the criminal and the criminal's intended target.

This European Standard is not intended to cover standalone or mobile security fog systems.

This European Standard has been designed to be flexible enough to encourage and encompass future developments in the field of security fog systems.

1 Scope

This European Standard specifies the requirements for security fog systems as a part of an I&HAS. It covers application and performance and also gives the necessary tests and trials to ensure efficiency and reliability of such obscuration devices.

This European Standard also gives guidance on the criteria for design, installation, operation and maintenance of security fog systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50130-4:1995 A1:1998 A2:2003	Alarm systems – Part 4: Electromagnetic compatibility – Product family standard: Immunity requirements for components of fire, intruder and social alarm systems
EN 50130-5:1998	Alarm systems – Part 5: Environmental test methods
EN 50131-1:2006	Alarm systems – Intrusion and hold-up systems – Part 1: System requirements
EN 50131-5-3:2005 A1:2008	Alarm systems – Intrusion systems – Part 5-3: Requirements for interconnections equipment using radio frequency techniques
EN 60065:2002 A1:2006 + corr. Aug. 2007 A11:2008	Audio, video and similar electronic apparatus – Safety requirements (IEC 60065:2001, mod. + A1:2005, mod.)
EN 61000-6-3:2007	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006)

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this document, the terms and definitions given in EN 50131-1 and the following apply.

3.1.1
confirmed intrusion
signals or messages emanating from two or more independent intrusion detectors indicating there is a high probability that a genuine intrusion or genuine attempted intrusion has occurred within a specified timeframe

3.1.2
obscuration
the reduction in visibility as a result of the activation of a security fog system

3.1.3
protected area
the designated space the security fog system is designed to restrict the visibility in when operated

3.1.4
security fog system
a device (or a series of separate independent components that make up a device) or system within tamper resistance housing(s), that, when activated, produces a dense artificial fog, from a consumable, to reduce visibility in the protected area

3.1.5
verification
the process whereby the security fog system will only operate once the Intruder Alarm System (IAS) has operated and a detection device in the area of the security fog system has triggered or an Hold-up Alarm System (HAS) has been operated

3.1.6
wet fog
this may result from incomplete atomisation of the fogging agent causing a direct spray or spatter from the fog ejection nozzle. This may also result from poor atomisation of the fogging agent causing individual fog particle size to be too large. Such large particles may fall down and settle on level surfaces as a greasy residue

3.2 Abbreviations

For the purposes of this document, the abbreviations given in EN 50131-1 and the following apply.

EMC	Electromagnetic compatibility
IK	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts
IP	Ingress protection classification
LEA	Law Enforcement Authority (Police or governmental body that responds to activations from security systems)

4 Environmental

4.1 Environmental classification

The security fog system shall meet, as a minimum, Environmental Class II (Indoor – General: environmental influences normally experienced indoors when the temperature is not well maintained) in accordance with EN 50131-1.

EXAMPLE In corridors, halls or staircases and where condensation can occur on windows and in unheated storage areas or warehouses where heating is intermittent.

NOTE Temperatures may be expected to vary between -10 °C and +40 °C with the average relative humidity of approximately 75 % non-condensing.

4.2 Environmental tests

For all operation the security fog system shall not activate, generate tamper, fault or other signals or messages when subject to the specific range of environmental and EMC conditions and shall continue to function normally.

The following Class II level environmental tests from EN 50130-5 shall be applicable when testing the security fog system:

a) Clause 8: dry heat operational;
b) Clause 10: cold test operational;
c) Clause 14: damp heat, cyclic operational;
d) Clause 17: sulphur dioxide (SO_2) (endurance);
e) Clause 20: impact operational;
f) Clause 22: vibration sinusoidal (operational);
g) Clause 23: vibration sinusoidal (endurance);
h) Clause 27: electromagnetic compatibility, immunity (operational).

5 Access levels

The access levels used in this standard shall be as stated in EN 50131-1:2006, 8.3.1, except for access level 2. Access level 2 “user” shall not be able to access the security fog system.

6 Regulation requirements

6.1 General

The security fog system shall operate to the following minimum relevant European regulations.

6.2 Electrical safety

The electrical (safety) construction of the security fog system shall be to EN 60065.

6.3 Safety data sheets

The transport, storage and handling of consumables, shall comply with the requirements stated on the safety data sheets.

6.4 EMC requirements

The security fog system shall meet the EMC conditions and the severity levels defined in EN 61000-6-3 and EN 50130-4.

6.5 Warning signs

As a minimum security fog device/system warning signs shall be positioned on the normal entry point(s) to the building (European safety signs Directive 92/58/EEC). See Annex B.

6.6 Pressure vessels

Any security fog system that contains pressure vessels shall be transportation and its usage shall meet the current industry safety requirements (see Directive 97/23/EC, Article 3).

7 Device/system parameters

7.1 Performance

The security fog system shall meet the following minimum performance:

- Reduction of visibility to 1 m within 60 s in a minimum volume of 150 m³ and maintaining obscuration for a period of 10 min in an un-vented room (performance tests shown in Annex A).

The performance of the security fog system shall be detailed as shown in Annex A.

7.2 Battery backup requirement

The battery backup requirements of a security fog system cannot achieve compliance of EN 50131-1 due to the amount of energy used to power the security fog system.

As a general requirement a security fog system shall be capable of a single full system operation for a period within one hour after mains fail.

A single full system operation shall be defined by the manufacturer in the security fog system specification.

7.3 IP/IK rating

All component parts shall be housed in an enclosure meeting the following requirements:

– IP rating of IP20;

– IK rating of IK08.

7.4 Wire free interconnections

If wire free interconnections are used then the requirements shall meet EN 50131-5-3.

8 General requirements

8.1 Tamper

All material parts and components of the security fog system shall be inside (a) secure, tamper-resistant outer case(s). The opening by normal means of access to the outer case(s) shall create an (a tamper message or signal) alarm condition.

The security fog system shall not eject fog on an individual tamper signal or message if the I&HAS is in the unset condition.

8.2 Fog neutralisation

A security fog system shall not be damaged or neutralised by the phenomenon (fog) it is supposed to produce.

8.3 Discharge nozzle

8.3.1 Nozzle protection

The discharge nozzle shall be protected to avoid any risk of injury with the security fog system in standby mode.

8.3.2 Nozzle blocked

If the discharge nozzle becomes blocked then it shall not cause a hazard.

8.4 Fog eject limiter

The security fog system shall incorporate a method for limiting the quantity of ejected fog in order to reduce the possibility of damaging residue.

8.5 Heating unit

The temperature of the heating unit shall be fully monitored and controlled to ensure that it remains within manufacturer's parameters.

8.6 Overheating

The heater unit shall be fitted with a thermal cut off device to prevent overheating outside the manufacturers' parameters. When the thermal cut off operates it shall require a reset by an authorised technician.

8.7 Accidental triggering

The security fog system shall not be able to be triggered by an unset I&HAS, but the security fog system can be triggered by a set HAS if so configured.

8.8 Isolation of the security fog system

There shall be a means of isolating the security fog system from the CIE to avoid a maintenance technician triggering the security fog system during routine maintenance.

8.9 Fixings

Fixings/mountings shall be appropriate to prevent unauthorised removal or tamper.

9 Operational requirements

9.1 Communication

The security fog system shall be capable of communicating with the host I&HAS.

9.1.1 Minimum information to be communicated

a. INPUTS into the security fog system:

i. set/unset,

ii. trigger,

iii. verification.

b. OUTPUTS from the security fog system:

i. security fog system active,

ii. tamper,

iii. low battery charge (if applicable),

iv. mains fail,

v. no consumables,

vi. incorrect temperature.

NOTE For outputs iii to vi a single signal or message may represent these conditions.

9.1.2 Non-critical faults

There are non-critical faults such as low consumables, etc. These may be transmitted as a separate signal or message.

9.1.3 Optional signals

Additional inputs/outputs may be provided (e.g. fire alarm inhibit).

9.2 Fault monitoring

The security fog system shall be monitored so that a fault (see 9.1) will generate a signal or message, which shall be transmitted back to the host I&HAS.

9.3 Power failure

A power failure shall not lead to the triggering of the security fog system.

If a power failure occurs, the security fog system shall send a signal or message to the I&HAS within 2 min, and where an ATS exists for remote notification at the I&HAS, immediately notification to the ARC shall occur.

9.4 Efficacy

The security fog system shall produce fog that provides obscuration within the protected area according to the manufacturer's specification.

9.5 Non-toxicity

The manufacturer shall provide proof that the consumables and the emitted fog do not present a toxic hazard to persons in normal use and manufacturers specified fluid life-time bearing in mind the use of the security fog system. This assessment shall be carried out by a accredited laboratory in the relevant field and shall include the following minimum elements:

– identification for the product tested;
– bibliographical research;
– a chromatographic test assessing all the components, including gaseous components;
– the laboratory's conclusions.

9.6 Residue

The security fog system used in accordance with the manufacturer's instructions shall not result in damaging residue in the area of use.

10 Consumables

10.1 Replenishment

The consumables used in security fog systems shall be replaced/replenished by the manufacturer/installer in accordance with manufacturer's instructions.

10.2 Formulation

All formulations for all fluids and propellants shall be recorded and maintained by original equipment manufacturer.

10.3 Traceability

All consumables shall be identifiable and traceable back to the security fog system manufacturer.

11 Marking

The security fog system shall be marked in accordance with EN 50131-1 and statutory requirements.

12 Documentation

The following minimum documentation shall be available:

– user instructions;
– installation instructions;
– maintenance instructions;
– a safety data sheet on all consumables;
– security fog system warning signs.

13 Design, installation, operation and maintenance (informative)

Guidance information for installers and maintainers on the design, installation, operation and maintenance is shown in Annex C.

Annex A
(normative)

Performance tests

This annex states the test procedure for evaluating fog output and fog performance.

NOTE Since it is accepted that there is a direct relationship between the concentration of airborne fog chemical and visibility through the resulting fog, this has been selected as the most appropriate basis of quantifying fog output/performance of the EUT (Equipment Under Test).

The following tests should be carried out in a fog test chamber as detailed below.

A.1 Fog test chamber

The fog test chamber shall be set up as detailed in Figure A.1.

The fog test chamber shall be, apart from as otherwise detailed in this document, an empty and windowless room or enclosure of volume (150 - 200) m³, with a height to ceiling of (2,5 - 3) m. The volume of the test chamber shall be recorded as (v). The ratio of length to width shall be between 1:1 and 2:1.

The chamber shall be well lit (300 lx - 500 lx measured at 76 cm above the floor of the chamber).

Four distribution fans (as shown in Figure A.1) shall be mounted as the same level in the machine equal distance between the security fog system and the corner of the room as indicated with the flow rate to give a homogenous distribution in the room. The fans shall be rated with a flow rate of between (0,15 - 0,3) m³/s and the maximum fan tip speed shall not exceed 3 m/s.

NOTE The distribution fans are only used to calculate the amount of fog chemical used.

The staggered black cross markers (as per Figure A.2) shall be positioned at the observers/operators eye level, at 2 m and 3 m from the viewing position of the observer.

The staggered grey/black marker (as per Figure A.3) shall be positioned at the observers/operators eye level, at 1 m from the viewing position of the observer.

The chamber shall be at (20 - 22) ºC, with a relative humidity of (40 - 75) %.

The EUT shall be placed centrally within the chamber, so that the output nozzle is 1 m above floor level. If the EUT has multiple output nozzles, the centre of the group of nozzles shall be at 1 m above floor level.

The EUT shall be mounted on a calibrated digital weighing scale, measuring in single gram increments.

All necessary supply leads to the EUT shall be supported in such a way as to nullify their impact on the calculation of the amount of fog chemical used.

A.2 Test procedure

Determination of fog chemical concentration to achieve 1 m visibility (1 OD/m, 90 % obscuration) that is essentially a measure of the efficiency of the fog.

The purpose of the first part of the test is to determine the amount of fog chemical required by the EUT to achieve a uniform 1 m visibility through the fog in the test chamber.

For each activation of the EUT the weight of chemical used per activation shall be recorded. For the sake of accuracy, and if the manufacturer of the EUT agrees, the flow rate through the EUT may be reduced so that the visibility target is achieved more progressively, since the purpose of this exercise is to determine the consumption of fog chemical (mg/m^3) to achieve 1 m visibility, not to equate fog output. Alternatively, the manufacturer of the EUT may elect to produce smoke in short bursts to achieve the same result.

The distribution fans shall be switched on within the chamber to ensure even fog distribution is achieved once the EUT is activated. The observer/operator within the chamber shall activate the EUT.

The observer/operator within the test room shall stop the EUT when the black element of the 1 m marker is not visible, and the weight of fog chemical used to achieve that visibility noted.

The test chamber shall then be cleared of fog and this procedure shall be repeated 2 times, and the mean average weight (zi) of fog chemical used calculated.

A.3 Activation test

The purpose of this part of the test is to enable specific performance figures to be attributed to individual EUT's.

The test chamber shall be clear of all visible fog. Distribution fans shall not be used in this test.

From start time (t0) the observer/operator shall activate the EUT until the weight of fog chemical used is as in A.2. Record this time as (t1).

The observer/operator shall then assume his viewing position.

Two minutes after (t1), the observer/operator shall confirm that the greyscale element of the 1 m marker is not visible. It is accepted that the black element of the 1 m marker may just be visible.

If the greyscale element of the 1 m marker is visible at this stage repeat procedure A.2, reducing the distance to the first marker by 0,1 m. Re-calculate the mean average weight accordingly (zi), and repeat test A.3 onwards (having re-sited the first marker back to 1 m). Continue to do this until the greyscale element of the 1 m marker is completely obscured (i.e. (zii) equals the 2^{nd} mean average weight, (ziii) equals the 3^{rd} mean average weight).

The observer/operator shall continue to view the marker line and shall note the time, in seconds, that the 2 m and 3 m marks become visible. Record these times as (t2) and (t3).

Repeat this test 2 times to achieve mean average times for (t1)/(t2)/(t3). These averaged times shall be referred to a (T1)/(T2)/(T3).

A.4 Fog output of EUT

The data from A.2 and A.3 are then used to calculate the fog output at 1 m fog visibility in m³/s.

Fog concentration (c) to achieve 1 m visibility (mg/m³) $c = z$ [1] $\times$ 1 000/v

Fog chemical usage rate (r) (mg/s) $r = z$ [1] $\times$ 1 000/T1

Fog output of EUT (m³/s) at 1 m visibility r/c

A.5 Fog persistency

The following results shows the rate of decay of obscuration.

Record the following:

Time for fog density to decay to 2 m (T2) – (T1) (s)

Time for fog density to decay to 3 m (T3) – (T1) (s)

A.6 Fog output over test periods

To account for the different methodologies of fog production, and to take into account rest periods that may apply to some systems, each manufacturer shall calculate the total cumulative fog output (in m³/s) that would be produced for the following periods after that first activation of the system.

Table A.1

Total fog output (m³/s) at 1 m visibility		**Time following activation**
Manufacturer claim	Testhouse result	
		15 s
		30 s
		1 min
		3 min
		5 min

[1] If it is necessary to re-calculate “z” as per A.3, then the re-calculated “zi”, or “zii”, etc. shall be used.

A.7 Fog visibility/density table

For reference, visibility through the fog can be equated to optical density and obscuration as in Table A.2 below.

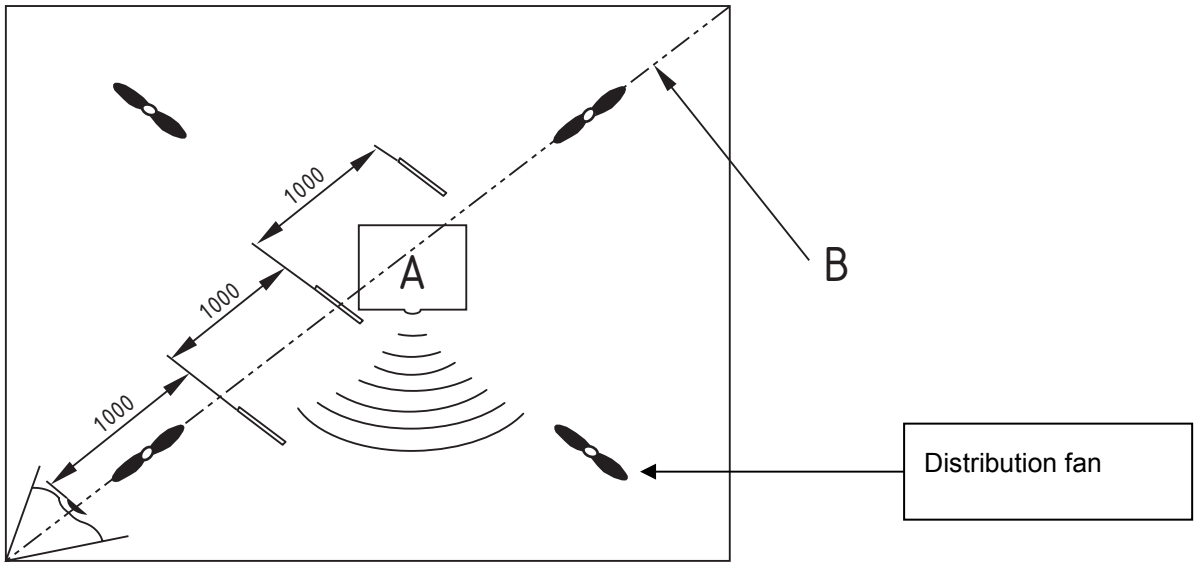
Table A.2

Visibility m	**Optical density** 1/m	**% Obscuration** % ob/m
1	1	90
2	0,5	68,37
3	0,333	53,58

A.8 Performance data

Based on the test procedure detailed in this annex the following performance data relating to the EUT shall be stated in the testhouse test report:

Based on a test room (150 - 200) m³		**Test results**
Fog output of EUT (m³/s) at 1 m visibility	=	
Time (s) for fog density to decay to 2 m	=	
Time (s) for fog density to decay to 3 m	=	
Total fog output (m³/s) at 1 m visibility after 15 s	=	
Total fog output (m³/s) at 1 m visibility after 30 s	=	
Total fog output (m³/s) at 1 m visibility after 1 min	=	
Total fog output (m³/s) at 1 m visibility after 3 min	=	
Total fog output (m³/s) at 1 m visibility after 5 min	=	
Fog concentrate usage to achieve 1 m visibility (mg/m³)	=	



Test chamber height:	(2,50 - 3,0) m
Test chamber volume:	(150 - 200) m³
Lighting within chamber:	(300 - 500) lx at 76 cm above floor
Relative humidity:	(40 - 75) %
Test chamber temperature:	(20 - 22) °C

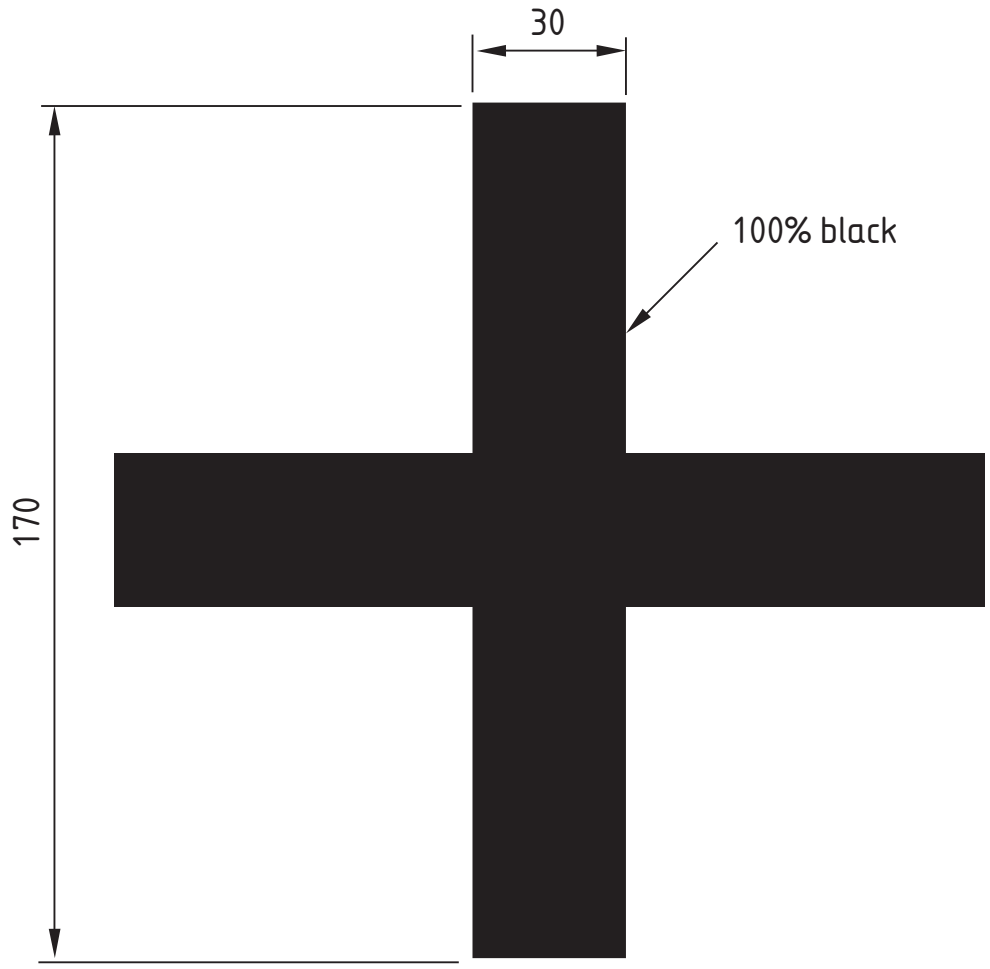
NOTE All dimensions are in millimetres.

Key

A = Equipment Under Test (EUT)

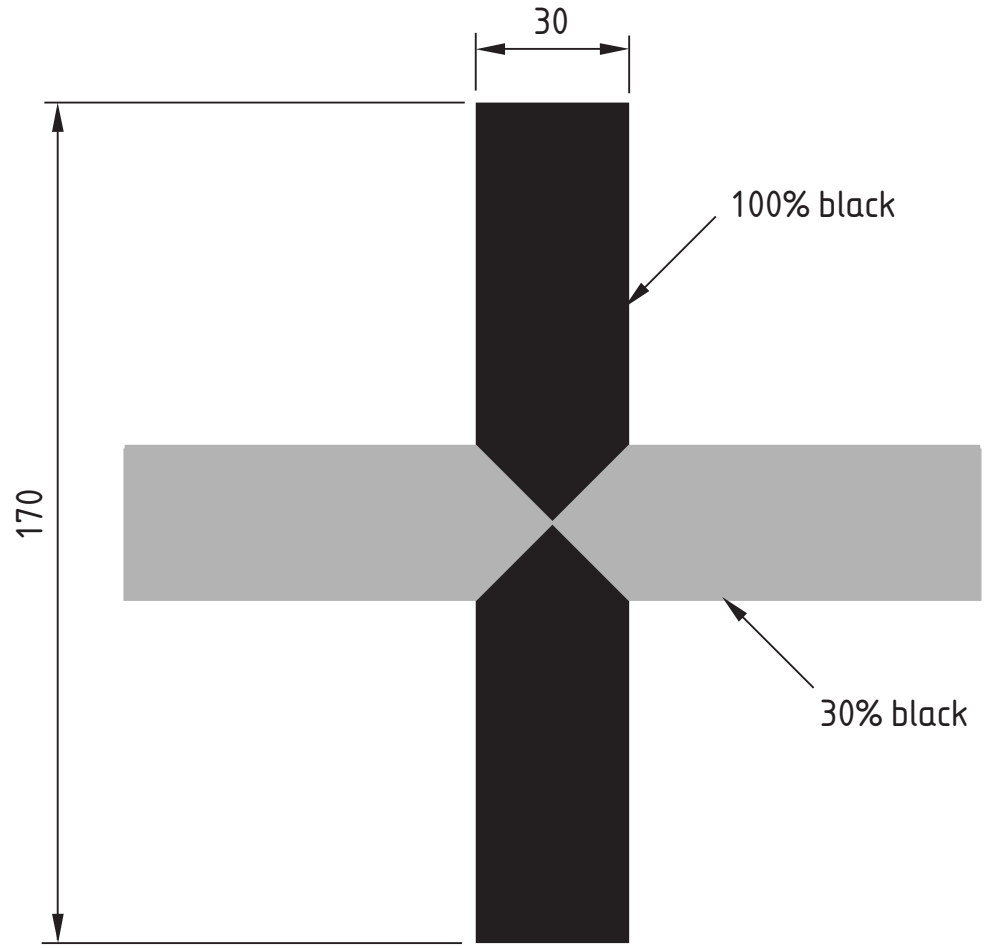
B = Visibility marker line

Figure A.1 – Test chamber



NOTE All dimensions are in millimetres.

Figure A.2 – Target



NOTE All dimensions are in millimetres.

Figure A.3 – Partial target

Annex B
(normative)

Security fog system warning sign

WARNING
SECURITY FOG DEVICE INSTALLED

Figure B.1 – Security fog system warning sign

Table B.1 – How to calculate the size of sign you need

Height of signs and maximum viewing distances		
Maximum viewing distances m	**Minimum symbol height** mm	**Recommended letter height supplementary text signs** mm
7	60	5
9	80	7
14	120	10
21	180	15
28	240	20

Annex C
(informative)

Guidance on design, installation, operation and maintenance of the security fog system

C.1 Risk assessment

The use and location of the security fog system will be determined by the risk of intrusion assessment carried out and specific manufacturer instructions.

If a security fog system is to be fitted to an I&HAS that is already installed then a full risk assessment should be carried out to ensure the I&HAS and security fog system are integrated to give the best detection and coverage.

As part of the risk assessment consideration should be given to the time taken to obscure the protected areas to meet the owners/insurers requirements.

Consideration should be given to providing visual and/or audible indications in the premises on activation by the security fog system.

C.2 General notification

The installer and/or owner should inform the LEA, the local fire authority and ARC of the installation prior to the security fog system being commissioned. A record of notification to these organisations should be kept by the installer and/or owner.

C.3 Confirmation triggering

Consideration should be given for the triggering of the security fog system by a confirmed intrusion.

C.4 Multi-occupancy

In multi-occupancy buildings or very large sites with internally protected areas the security fog system should be installed so as to contain the fog within the protected area(s) as far as practicable so as not to infringe on to public areas or open areas except for security fog systems which are activated by the use of a hold-up system.

NOTE For this type of building or site it is recommended that, on alarm activation, an audible warning of the presence of a security fog system be given.

C.5 Man trap – building unoccupied

The security fog system should not be configured to form a “man trap”, i.e. it should not be the intention to deliberately trap persons or prevent escape.

C.6 Hold-up – Building occupied

When a security fog system is used in a hold-up situation the following should be considered:

a) the local fire authority and the LEA should be informed that a hold-up system has a security fog system installed;

b) there should be a full risk assessment carried out on the location and use of a security fog system in the hold-up situation;

c) the security fog system should be placed so that the fog generated moves from the target area to the exit area;

d) there should be signage (as per European safety signs Directive 92/58/EEC) in the premises informing all persons that there is a security fog system installed and the action to take if the security fog device is activated. (e.g. that the security fog system has operated and the LEA is attending);

e) there should be a voice module, which operates concurrently with the activation of the security fog system which contains the same message as the signage (e.g. that the security fog system has operated and the LEA is attending);

f) the staff should be fully trained in the use of the security fog system with the hold-up system.

C.7 System test

A full security fog system test should be carried out to meet the specified system performance and the results recorded. During the security fog system test the fire alarm system should be put on test or inhibited.

C.8 Training

The installation of the security fog system should be undertaken by individuals who have successfully undergone a formal training course on the equipment and have taken a written and practical test and have proven their competence in installation and maintenance of the equipment.

C.9 Manufacturers requirements

Testing and preventative maintenance should be undertaken according to manufacturer's instructions.

Bibliography

[1] OJ L 245, 26.8.1992, p. 23–42, Council Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work (ninth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

[2] OJ L 181, 9.7.1997, p. 1–55, Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment

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