

Banknote theft deterrent systems using dye or smoke-dye

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Foreword

This Publicly Available Specification, PAS 40, has been prepared by BSI to provide an interim specification for banknote theft deterrent systems using dye or smoke-dye.

PAS 40 is not a British Standard. PAS 40 will be withdrawn on publication of its content in, or as, a British Standard.

This Publicly Available Specification is not intended to restrict new developments in design and materials.

Whilst every effort was made in the development of this Publicly Available Specification to take into account the practical application of the tests included, a full set of tests was not carried out prior to publication of the PAS. BSI therefore welcomes any information and experience relating to its practical application. Comments arising from the use of this PAS should be sent in writing to the Secretary of BSI Technical Committee GW/2/1 at British Standards House, 389 Chiswick High Road, London W4 4AL.

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Attention is drawn to the following statutory regulations:

Control of Substances Hazardous to Health Regulations 1994 [1]

Firearms (Amendment) Act 1997 [2]

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 30, an inside back cover and a back cover.

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Introduction

The banknote theft deterrent systems covered by this PAS rely on the deployment of dye or smoke-dye as deterrents against theft.

The dye used in dye-based systems usually functions either solely as a degrading agent, or as a smoke-dye device with a degrading effect. The dye is used – either alone in liquid form or as smoke-born particles in combination with heat – to stain/discolour the banknotes, deterring theft by degrading them to a point of no value to a thief, thus rendering them unusable in the general marketplace, whilst allowing them to be recognized in order that their value can be redeemed by the relevant issuing authority. Attempts to remove the effects of liquid dye degradation result either in residual staining remaining on the banknotes or in significant alteration of the banknote medium.

With the knowledge that the proceeds of the robbery will be recognizable as having been degraded, and that the triggering of a smoke-dye device will greatly hinder the robbery, experience demonstrates that the thief consistently relinquishes the proceeds of the robbery or abandons the criminal act.

There are three main types of banknote theft deterrent system which use dye or smoke-dye. For the purposes of this PAS, these have been categorized as class I, class IIa and class IIb.

Class I systems rely on banknote degradation as the main deterrent against theft. These systems deploy a fast-acting liquid dye which extensively penetrates and stains the banknotes. Class I systems are effective in providing a high level of degradation. They also typically incorporate mechanisms for threat detection and response, and can include communication capabilities and also smoke-dye devices.

Uses of class I systems include, but are not restricted to the protection of consignments or packages of banknotes, such as ATM cassettes, during or awaiting transit or within safes and teller areas.

Class II systems deploy smoke-dye devices when subjected to an attack. The smoke-dye devices produce a dense, coloured cloud of smoke which has the primary function of deterring theft by reducing visibility, attracting the attention of witnesses and staining clothing etc in the vicinity, as well as degrading banknotes to a noticeable (and defined in the case of class IIa) level by means of dye particles in combination with a smoke-burn effect along the edges of the banknotes. Class IIa systems can incorporate mechanisms for threat detection and response, and can include communication capabilities.

Uses of class IIa systems include but are not restricted to the protection of banknotes during or awaiting transportation, for example a cross-pavement carrier (smoke-dye box).

Uses of class IIb systems, in addition to those given for class IIa, include but are not restricted to the protection of banknotes within safes (other than ATM safes) and teller areas.

As it is difficult to anticipate the time and location of a robbery, it is essential that systems and the procedures which are supplied with them, are able to ensure reliability of activation when subjected to an attack, but resist activation in the course of normal, authorized handling. This PAS defines the requirements for reliable activation and resistance to unintended activation.

1 Scope

This PAS specifies requirements for class I, class IIa and class IIb banknote theft deterrent systems using dye or smoke-dye, where class I, class IIa and class IIb systems are as defined in 3.4, 3.5 and 3.6 respectively.

Type testing for activation and functioning of systems under attack, measurement of degradation levels and measurement of smoke density is also included.

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.

BS 6001-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection.*

BS EN 1303:1998, *Building hardware — Cylinders for locks — Requirements and test methods.*

BS EN 50268-1:2000, *Common test methods for cables under fire conditions — Measurement of smoke density of cables burning under defined conditions — Part 1: Apparatus.*

BS EN 60068-2-6:1996, *Environmental testing — Tests — Part 6: Test Fc: Vibration (sinusoidal).*

BS EN 60068-2-18:2001, *Environmental testing — Tests — Part 18: Tests R and guidance: Water.*

BS EN 60068-2-27:1993, *Environmental testing — Tests — Part 27: Test Ea and guidance: Shock.*

BS EN 60068-2-32:1993, *Environmental testing — Tests — Part 32: Test Ed: Free fall.*

BS EN 60068-2-64:1995, *Environmental testing — Test methods — Part 64: Test Fh: Vibration, broad-band random (digital control) and guidance.*

BS EN 60721-3-7:1996, *Classification of environmental conditions — Classification of groups of environmental parameters and their severities — Section 3.7: Portable and non-stationary use.*

BS EN 61000-4-2:1995, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test.*

BS EN 61000-4-3:2002, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test.*

BS EN 61000-4-8:1994, *Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test.*

3 Terms and definitions

For the purposes of this PAS, the following terms and definitions apply.

3.1

activation

triggering of the mechanism which deploys the degrading agent or smoke-dye device and, where fitted, other protective functions

3.2**application**

combination of the banknotes, container, wrapping (where applicable), packing method, environmental conditions of operation and any operational constraints

3.3**carrier**

cash-in-transit guard or other person(s) authorized to carry the system and application during transit between authorized locations in the normal course of business

3.4**class I system**

banknote theft deterrent system which uses liquid dye to effect a high level of degradation by staining as the sole or main deterrent against theft

3.5**class IIa system**

banknote theft deterrent system which generates smoke-dye as a theft deterrent with a defined level of degradation

3.6**class IIb system**

banknote theft deterrent system which generates smoke-dye as a theft deterrent with an undefined level of degradation

3.7**container**

case, cassette, bag, box or similar item, as part of the system, in which the banknotes are enclosed

3.8**degradation**

<of class I systems> process by which banknotes are visibly stained by a degrading agent

3.9**degradation**

<of class II systems> process by which banknotes are visibly stained and/or discoloured by dye particles in combination with a smoke-burn effect

3.10**degrading agent**

in class I systems, dye applied to the banknotes to effect degradation

3.11**packing method**

manner in which the banknotes are placed in the container

3.12

system

combination of the degrading agent or smoke-dye device and the mechanism which triggers it and any other protective features that might be fitted

3.13

wrapping

material surrounding the banknotes within a container

4 Requirements applicable to class I systems only

4.1 General

Manufacturer's procedures for factory product release, commissioning, servicing and routine testing shall include a function test (excluding activation).

The system shall be equipped with an indicator to show that activation has occurred.

The system shall be equipped with a feature, for example a label affixed to the product, to enable indication that the service procedures recommended by the manufacturer have been carried out.

4.2 Degradation

Activation of the system and subsequent measurement of the resulting degradation level on the banknotes in accordance with **A.5.1** shall result in 100 % of a sample of 100 banknotes being stained on each face over an area equal to or greater than 20 % of the area of the banknote face. Of that stained area, a proportion shall be contained within two defined areas (which may overlap), each of which shall be at least 5 mm × 25 mm. Each defined area shall be perpendicular to the longest and shortest edges of the banknote within an area bounded by a line drawn 15 mm from every edge of the banknote. An example of this is shown in Figure 1.

The staining shall be such that attempts to remove its effects in accordance with **A.6** shall result in residual staining (which shall be obvious to the untrained eye) remaining on the banknotes to the specified percentage level and within the defined areas specified, and/or partial (but obvious to the untrained eye) or total removal of print, colour and security features on the banknotes.

NOTE Chemicals used in degrading agents are subject to the requirements of the Control of Substances Hazardous to Health Regulations (COSHH) [1], which require the manufacturer to provide material safety data sheets (MSDS) with sufficient information to enable the user to prepare a thorough assessment of the product and emergency procedures for its use.

All dimensions are in millimetres

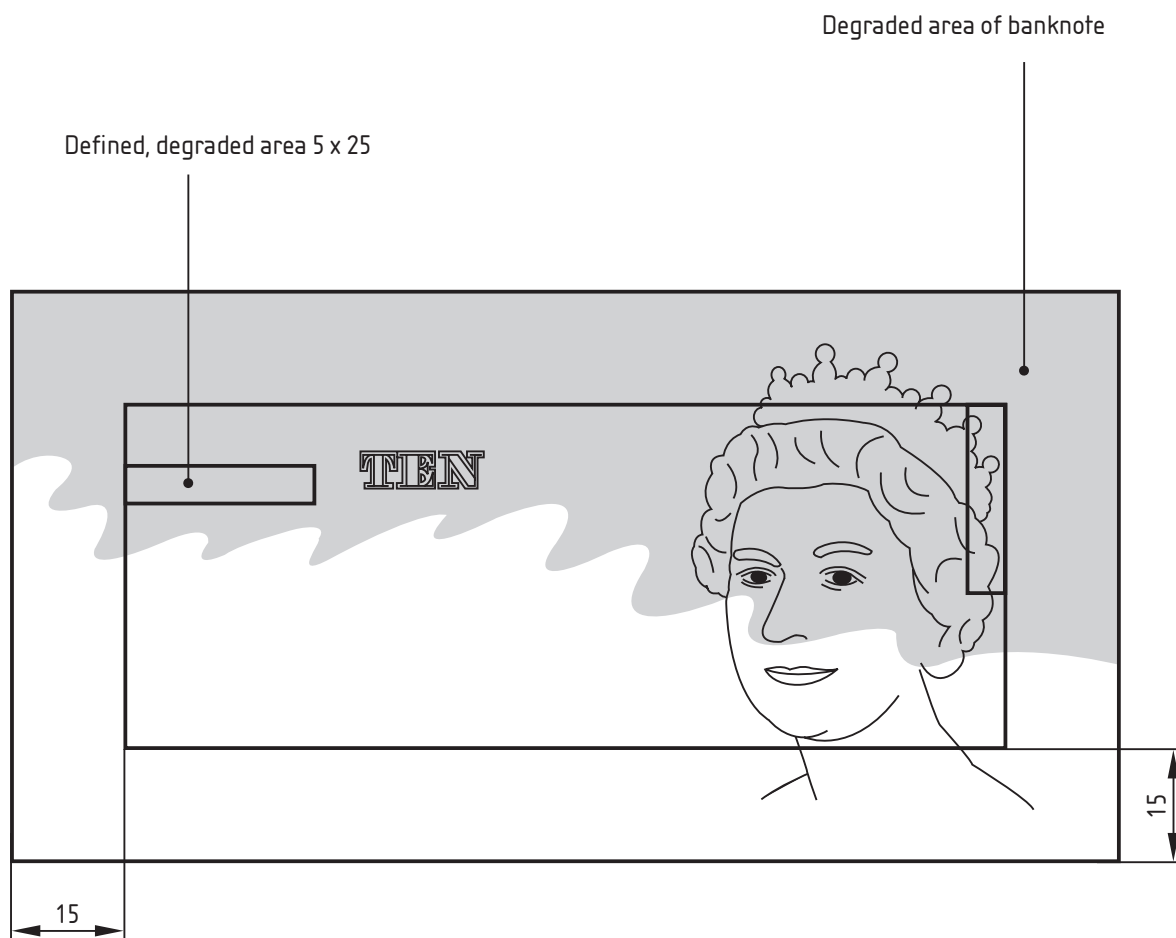


Figure 1 — Degradation requirements of class I systems

4.3 Deactivation

As robberies are usually accompanied by the threat of force, the system shall have the capability of preventing the carrier from being able to deactivate the system.

Systems provided with electronic deactivation shall be resistant to electrical tampering (See 4.5.1.2).

Systems provided with deactivation by mechanical key locking shall be fitted with a lock incorporating a cylinder conforming to BS EN 1303:1998, grade 5.

4.4 External triggering

Where a class I system has an interface enabling it to be activated in response to an external trigger [e.g. from an automated teller machine (ATM)], the interface shall be function tested according to the manufacturer's procedures (see 4.1).

4.5 Activation and functioning of systems under attack

4.5.1 *Electrotechnical and electromechanical class I systems*

4.5.1.1 *Exposure to electromagnetic interference*

4.5.1.1.1 *Radio frequency electromagnetic interference (RF EMI)*

The system shall be constructed so that exposure to RF EMI in accordance with BS EN 61000-4-3:2002, (with the modifications given in **6.4.3.1** of this PAS) does not affect the system such that activation is prevented.

NOTE The radio frequency electromagnetic interference test is also a requirement of **6.4.3** of this PAS, since systems also need to be able to resist unintended activations as a result of unintended electromagnetic exposure. The test need only be carried out once to determine both the resistance to attack and the resistance to unintended activation.

4.5.1.1.2 *Power frequency electromagnetic interference*

The system shall be constructed so that exposure to power frequency electromagnetic interference in accordance with BS EN 61000-4-8 (with the modifications given in **6.4.3.2** of this PAS) does not affect the system such that activation is prevented.

NOTE The power frequency electromagnetic interference test is also a requirement of **6.4.3** of this PAS, since systems also need to be able to resist unintended activations as a result of unintended electromagnetic exposure. The test need only be carried out once to determine both the resistance to attack and the resistance to unintended activation.

4.5.1.2 *Electrical tampering*

The system shall be constructed so that application of a low voltage in accordance with **A.4.2** does not affect the system such that activation is prevented.

4.5.1.3 *Power source tampering*

The system shall be constructed so that a reduction in the power source of the system in accordance with **A.4.3** does not affect the system such that activation is prevented.

4.5.1.4 *Exposure to electrostatic discharge (ESD)*

The system shall be constructed so that exposure to ESD in accordance with **A.4.4** does not affect the system such that activation is prevented.

4.5.2 *All class I systems*

4.5.2.1 *Application of temperature extremes*

The system shall be constructed so that application of extremes of temperature in accordance with **A.4.5** does not reduce the effectiveness of degradation nor affect the system such that activation is prevented.

4.5.2.2 *Immersion in chemicals*

The system shall be constructed so that immersion in chemicals in accordance with **A.4.6** does not reduce the effectiveness of degradation nor affect the system such that activation is prevented.

4.5.2.3 *Injection of chemicals*

The system shall be constructed so that injection of chemicals in accordance with **A.4.7** does not reduce the effectiveness of degradation nor affect the system such that activation is prevented.

4.5.2.4 *Firearm attack*

The system shall be constructed so that an attack using a firearm in accordance with **A.4.8** does not reduce the effectiveness of degradation nor affect the system such that activation is prevented.

4.5.2.5 *Mechanical manipulation*

The system shall be constructed so that mechanical manipulation of the system in accordance with **A.4.9**, either alone or in combination with any of the other methods of attack given in **A.4** does not reduce the effectiveness of degradation nor prevent or delay activation.

5 Requirements applicable to class II systems only

5.1 Class IIa systems

5.1.1 *General*

Manufacturer's procedures for factory product release, commissioning, servicing and routine testing shall include a function test (excluding activation).

The system shall be equipped with an indicator to show that activation has occurred.

The system shall be equipped with a feature, for example a label affixed to the product, to enable the results of service procedures recommended by the manufacturer to be recorded.

5.1.2 *Deactivation*

As robberies are usually accompanied by the threat of force, the system shall have the capability of preventing the carrier from being able to deactivate the system.

Systems provided with deactivation by mechanical key locking shall be fitted with a lock incorporating a cylinder conforming to BS EN 1303:1998, grade 5.

5.1.3 *Degradation*

Activation and subsequent measurement of the degradation level in accordance with **A.5.2** shall result in 95% of a sample of 100 banknotes showing, on each face, degradation which shall be clearly visible to the naked, untrained eye.

5.2 Class IIb systems

Manufacturer's procedures for factory product release, commissioning, servicing and routine testing shall include a function test (excluding activation).

6 Requirements applicable to class I and class II systems

6.1 Activation

Systems shall be constructed so that they are capable of activating automatically without manual intervention.