



Pay machines

Requirements, classification and test methods

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VdS Guidelines for Physical Security Devices

Pay machines

Requirements, classification and test methods

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1 Introduction

1.1 General

Pay machines serve for the settlement of services and issue either automatically or on request a receipt on the amount being deposited.

Examples for pay machines in the sense of these guidelines are decentral systems (off-street) which are mounted in parking areas (park houses) and which are used for settlement of parking fees or for settlement of service fees of public authorities.

Pay machines consist at least of the/an input/output unit and a reception unit for means of payment, the receipt printer, operating elements as well as a control unit.

Experience has shown that pay machines present a potential target for criminals which aim to take off the deposited cash.

Note: These guidelines consider only the area of pay machines, which contain banknote reader and accept or spend banknotes resp. coins in respect of forcible attacks. Manipulating attacks via system-related openings (fishing, trapping) and the control logics are not considered.

Note: These guidelines do not consider the area of pay machines where payment is made by EC-card and PIN-code input or credit card, i. e. for this area neither consideration regarding phishing is made.

The guidelines cover products for applications where security requirements are lower than the requirements of VdS 2450.

1.2 Scope

The present guidelines contain minimum requirements on pay machines for securing valuables against unauthorised access.

The present guidelines consider exclusively such machines, which especially contain banknote reader. It does not treat central systems which accept exclusively coins.

If the pay machine holds valuable blanks for ticket, the requirements of the guidelines VdS 3165en, Ticket Machines are to be applied in analogy.

2 Validity

These guidelines are valid from 01.11.2015.

Note: This is a translation of the German version. In case of discrepancies the German version shall be binding.

3 Normative References

These guidelines contain dated and undated references to other publications. The normative references are cited at the appropriate places in the clauses, the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to these guidelines only when announced by a change of these guidelines. For undated references the latest edition of the publication referred will be applied.

- DIN 900** Schraubwerkzeuge – Drehstifte für Steckschlüssel – Maße und Ausführung (assembly tools for screws and nuts – tommy bars for socket keys)
- DIN 1041** Schlosserhämmer (locksmith`s hammer)
- ISO 2936** Schraubwerkzeuge – Winkelschraubendreher für Schrauben mit Innensecks-kant (assembly tools for screws and nuts – offset screwdriver for screws with hexagon socket)
- VdS 2156** Richtlinien für mechanische Sicherungstechnik, Schließzylinder mit Einzel-sperrschließung (Guidelines for physical security – Locking cylinder with indi-vidual locking function)
- VdS 2227** Einbruchmeldeanlagen, Allgemeine Anforderungen und Prüfmethode (Intru-der Alarm systems – General requirements and test methods)
- VdS 2344** Verfahren für die Prüfung, Anerkennung und Konformitätsbewertung von Ge-räten, Bauteilen und Systemen der Brandschutz- und Sicherungstechnik (Procedure for the testing, approval and certification of products and systems for fire protection and security technologies)
- VdS 2396** Richtlinien für mechanische Sicherungstechnik, Hochsicherheitsschlösser (Guidelines for Physical Security – High Security locks)
- VdS 3165** Fahrausweisautomaten, Anforderungen, Klassifizierung und Prüfmethode (Ticket machines – Requirements, classification and test methods)

4 Terms and definitions

For application of these guidelines the general terms as comprised in VdS 2227 as well as the following terms are applicable.

Operating unit: The operating unit enables to system functions.

Operator: The person who is responsible for the operation of the pay machine.

Banknote scanning unit: System component which identifies valid means of payment (paper money) and which rejects means of payment the features of which are identified as being not valid.

Pay machine: Machine for payment or settlement of a service fee.

Coin scanner: System component which identifies valid means of payment and which rejects means of payment the features of which are identified as being not valid.

Opening time: The time during which the machine is accessible for any person.

Return resp. release container: Container able to return the amount of physical pay-ment after cancellation of a payment process as well as change needed and the receive the printed ticket

Service door: The service door renders possible the access to the valuables area and to technical function units of the pay machine.

Note: A pay machine may dispose of further doors.

Control unit: All functions of the pay machine are actuated via the control unit.

Connection unit – coins: The connecting unit links the coin slot by the coin scanner and the temporary container with the cash box – coins.

Connection unit – banknotes: The connecting unit links the notes slot by the note scanner and the temporary container with the cash box – notes.

Valuables area: Area for the storage of valuables, e. g. banknotes or coins.

Interim container – coins: A unit for accumulation of the totality of the cash – coins until confirmation or cancellation of the payment procedure.

Interim container – banknotes: A unit for accumulation of the totality of cash – banknotes – until confirmation or cancellation of the payment procedure.

5 Classification

VdS-approved pay machines are classified according to their resistance to burglary in one of the four pay machine classes

- K 1
- K 2
- K 3
- K 4

The requirements regarding duration of a possible attack success and the effectivity of the used tools increase from class to class – from K1 to K 4.

The potential duration of the unauthorised opening of an individual pay machine aiming to thief money holdings is – besides the construction of the machine – mostly depending of the choice of the used burglar/breaking tool, the professionalism and the experience of the offender as well as of the duration of use of the single tools (intensity of the attack).

The alignment of classes, testing times and testing tools is made according to table 6-1.

6 Requirements

6.1 Documentation

6.1.1 Handover of the documentation

The product documentation is to be handed over to VdS Schadenverhütung before start of testing. It shall fulfil the following criteria:

6.1.2 General documentation requirements

The documentation shall correspond with the following requirements:

- Issue date and name of manufacturer or name and function of the applicant who orders testing
 - For paper documentation: indication of these data on each side of the documentation
 - For documentation as files: authorization of data carrier by the applicant; the alignment of prints of the files is made VdS internally (e. g. by embedding a water-marking on each print side which exactly denominates the data carrier)
- Unambiguous statements on the type of product as well as model number

Depending of the information contained in the document (e. g. parts list, technical sketches) the test laboratory may require a certain kind of the document; the applicant shall comply with this request.

6.1.3 Required documentation

The documentaion shall contain the following records:

- Installation instructions for the product handed in for testing
- Operators instructions for the product handed in for testing including the functions being actuated via the operating unit
- Operating instructions for the product handed in for testing including the functions being actuated via the operating unit if not already covered by the operators instruction
- Indication on products having been tested and approved already or parts of products (e. g. profile cylinder or locking mechanism of a profile cylinder)
- Detailed sketch of the cash container and the service door
- Detailed sketch of cash box, if given
- Detailed sketch of the connection unit and – if given – the interim container
- documentation of circuits

6.1.4 Requirements on the sketches

The technical documentation (sketches and further documents) shall contain the following information:

- Cross and vertical sections
- Indication on number, alignment and features of locks, bolt work etc.
- Indication on number, distances and alignments of the door bolts, their dimensions (e. g. cross sections), bolt works and inclusions as well as types (e. g. movable or fix)
- Indication on position and construction of areas with special protection material
- Indication on purpose, alignment and dimension of each opening incl. detailed presentation of especially protected zones
- Specification of the used material

6.1.5 Information on hazardous substances

Details of any materials and devices that produce in case of an attack gases, smoke, soot etc. which can generate hazardous substances during the test shall be explained.

6.2 Marking

Pay machines shall be marked with

- Indication on manufacturer or trade mark as well as
- Type designation and
- Resistance class.

The marking shall be permanent and (if necessary after opening of certain doors) be visible.

In addition, the products shall be marked with the VdS-label according to VdS 2344.

6.3 Resistance characteristics

Table 6-1 summarises the resistance times as well as the burglar/break-open tools being admitted for use in the frame of testing and aligned to the respective pay machine classes.

Note: The test on requirements for anchoring of pay machines at the installation location is not part of the present guidelines.

Class of pay machine	Resistance time ¹⁾	Tool set ²⁾
K 1	3 min	Basic tool set, A, B
K 2	3 min	Basic tool set, A, B, C
K 3	5 min	Basic tool set, A, B, C
K 4	5 min	Basic tool set, A, B, C, D
1) The time during which the tool is in contact with the specimen (cf. paragraph 7.3.3).		
2) The tool sets are described in Annex A.		
Table 6-1: Requirements, overview		

6.3.1 Access to the valuables area of the pay machine

The closure (e. g. profile cylinder or high security lock) resp. the locking mechanism (e. g. security-related components of a profile cylinder) of the access to the valuables area of the pay machine shall fulfill at least the requirements of lock cylinders of class B according to the guidelines for lock cylinders with individual locking function, VdS 2156 or of locks of class 1 according to the guidelines for high security locks, VdS 2396.

For proof of the respective classe an attack on the closure according to table Table 6-1 is admitted.

Note: If the mounting of the used closure, e. g. locking cylinder of class B, does not correspond with the specification of the mounting instruction of the chosen closure, also the tools of the respective a. m. guidelines may be used in analogy for an attack on the closure.

7 Tests

7.1 Preparation of the tests

7.1.1 Test team

The test team comprises:

- The test team leader
he is responsible for planning, guidance and surveillance of the test
- The time keeper
he is responsible for the time keeping and issuing the test record
- The testers
these perform on instructions of the test team leader the necessary works on the specimen

Note 1: If necessary, the use of more than one time keeper is permitted.

Note 2: The test team leader may himself operate as test engineer and/or time keeper.

7.1.2 Time measurement

Used is a clock that holds a measurement uncertainty of 0.05 min or less (at 10 min) and a graduation of at least 0.01 min. If required, multiple clocks are used.

7.1.3 Record

The main test according to paragraph 7.3 is recorded. The record among others indicates which tools were used for which period.

7.2 Pre-tests

7.2.1 General

Before start of the main test, the following steps are performed.

7.2.2 Check of the documentation

A visual check of the documentation is performed. A documentation in the frame of the test report is not made.

The following tests will be performed only if all necessary documents according to clause 6.1 are available and the criteria there mentioned are fulfilled.

7.2.3 Pre-tests

Before performance of an attack test with tools and before elaboration of the test plan the test team may perform pre-tests at the specimen to become familiar with the construction of the specimen and – if given – to identify existing weak spots.

Times for the performance of pre-tests are not added to the resistance times.

A documentation of the pre-tests in the frame of the test report is not made.

7.2.4 Test plan

Before start of the main test (determination of resistance time) the head of the test team elaborates an individual test plan which describes the course of the test steps. The test plan is made such that after evaluation of the head of the test team as well as the test team in the frame of the test (by using the tool set according the intended pay machine class) the shortest resistance time is to be anticipated.

A documentation of the test plan in the frame of the test report is not made.

Note: Depending on the construction of the presented specimen several tests (if given also at several specimen) may become necessary.

7.2.5 Choice of the tools

On base of the test plan the choice of the tools which are to be used for testing is made. The choice comprises exclusively those tools cited in table Table 6-1 and in Annex A and which are admitted for testing within the pay machine class which is strived for.

For testing within class K 4 by using the hydraulic tool (specification according to Annex B) the following is valid: The point where the force of the hydraulic tool is applied shall not be changed during testing. A multiple appliance of the force onto this point is admitted.

Note: If necessary, the adapter required for applying the force are individually, matched to the specimen prepared. The time for preparation of the adapter(-s) is not part of the resistance time.

7.3 Main test

7.3.1 General

Aim of the main test is to determine if requirements on the product marking as well as constructional requirements on the specimen which influence its resistance capacity against unauthorised access are fulfilled and if within the resistance time indicated in table Table 6-1 and by using the tool set there indicated, the box container resp. the existing money box may be withdrawn or a possibility may be made by which the potential content of the box container resp. the existing money box may be withdrawn.

The specimen is mounted in analogy to the installation instructions of the manufacturer assuming worst conditions to reach sufficient stability.

7.3.2 Marking

A visual check is performed if the marking according to clause 6.2 is existing.

In addition, it is checked if these markings are sufficiently stable affixed, e. g. by tear-off attempts, wiping with water-saturated towel or by simple scratching.

The result of the test is recorded.

Note: if necessary, this test may be performed also after finalise of the main test at a serial product.

7.3.3 Time keeping

The times for reaching access onto the valuables according to clause 7.3.5 are taken and recorded with the clocks as described in clause 7.1.2. The times to be recorded start with applying the tool at the specimen and end with the removal of the tool. If the test is divided in several sub-tests being timely limited, the resistance time is calculated by the addition of the measured single applying times.

The applying times of the single tools are measured and recorded in the test report. The results of the single attacks may be documented. The end result of the attacks (after reaching the indicated resistance time) is documented.

7.3.4 Closure of the valuables areas of the pay machine

A visual check resp. check of documentation – and if necessary a test if the requirements on the bolting mechanism of the access to the pay machine according to clause 6.3.1 are fulfilled.

A test on the closure may be performed for the respective classes with the tools of the respective class.

The result of the test is recorded.

7.3.5 Access to the valuables areas of the pay machine

Using the tools according to clause 7.2.5 it is tested if

- The opening of the access to the valuables
- The access to single valuables areas

is possible.

The use of openings existing in the specimen (system-related openings) in the frame of the test, e. g. for reaching access to single valuables, is admitted without restrictions.

The result of the test is recorded.

Note 1: The times used according to clause 7.3.4 are added to the resistance time being admitted at maximum for the test according to table Table 6-1.

Note 2: The time being necessary for the removal of valuables from the respective valuable area is not added to the resistance time. However, if the test reveals that for removal of a better part of the deposited means of payment more than five times of the necessary resistance time is used for the pay machine class according to table Table 6-1, this requirement is seen to also be fulfilled.

Note 3: Special equipment which inhibit or impede the removal of valuables from the respective valuable area may be attacked. The times used for this attack are added to the resistance time being at maximum admitted for the test according to table Table 6-1.

Note 4: For attacks on a single rest money deposit which lead to only a removal of a part of the means of payment coins, are to be considered only to 50 % of the resistance time admitted at maximum for the test according to table Table 6-1.

7.4 Optional tests

On base of a customers request, as optional test for the pay machine classes K 1 to K 3 the tool attack for the opening of the access to the valuables or for the access to single valuables areas is performed by using drilling machine in connection with HSS-drills from tool set D for the resistance class aligned to the respective pay machine class.

This test is optional and does not raise the pay machine class. A passed optional test is noted in Annex 3 of the certificate.

Note: This test is more than covered by the here admitted tool set D for the pay machine class K 4.

Annex A Testing tools (normative)

Denomination	Type/specification
Basic tool set	
Screwdriver	Blade width 6 mm
Long-nose pliers	Length at max. 200 mm
Combination pliers	Length at max. 200 mm
Drift punch	DIN 900
Drift punch	FL 25 x 6 length at max. 250 mm
Drift punch	Rd Ø 15 length at max. 250 mm
Locksmith`s hammer	200 g acc. to DIN 1041
Hexagon socket screw key	max. length 120 mm; ISO 2936
Screw-wrench	max. length 180 mm
tweezers	AM 160 mm
Rope	Hemp rope/cord
Steel wire	Tying wire
Hook	Welding rod, curved
Electric torch	arbitrarily
Adhesive tape	Fabric tape, wrap tape
Knife	Blade length at max. 120 mm
Industrial vacuum cleaner	Rated input 2000 W including any suction adapter
Electrical power source	arbitrarily
Tool set A	
Screw driver	Blade width 10 mm
Screw driver	Blade width 14 mm
Wooden wedge	L/B/H 200/80/40 mm (at max.)
Plastic wedge	L/B/H 200/80/40 mm (at max.)
Water pump pliers	Length 240 mm
Gaspipes pliers	Length 240 mm

Tool set B	
Nail puller	Length 710 mm
Hammer	500 g acc. to DIN 1041
Tool set C	
Club hammer	1.5 kg; shaft length 400 mm
Axe/hatchet	Length 350 mm
Chisel	Any dimensions
Hacksaw	Any dimensions and blades
Metal shears	right; length 260 mm
Pipe wrench	Length 410 mm
Bolt cutter	Length up to 750 mm
Drift punch	Any dimensions
Screw driver	Any dimensions
Steel wedge	Any dimensions
Tool set D	
Drilling machine	Rated input up to 600 W
Drilling machine with percussion	Rated input up to 600 W
Hydraulic tools	Up to 50 kN at maximum, any adapter
Drill HSS	arbitrarily
Carbide drill HM	arbitrarily
Solid carbide drill (Jet)	arbitrarily
Hole saw	arbitrarily
Hole cutter	arbitrarily

Annex B Specifications of the hydraulic tool (normative)

Denomination	Type/Specification
<i>Piston pume with leverage activation</i>	
Manufacturer	Yale Industrial Products GmbH
Type	HPS – 1/0.7A
Tank capacity	0.7 l
Operating pressure	700 bar at maximum
<i>Measurement equipment</i>	
Manufacturer	HBM (Höttinger Baldwin Messtechnik)
Type	Digibar II – K-PE 300
Assembling manometer	Kl. 0.15 (adjustable to test force)
Measuring uncertainty	± 0.15 % from final value
Nominal measuring range	0...1000 bar
<i>Hydraulic cylinder</i>	
Universal cylinder	
Manufacturer	Yale Industrial Products GmbH
Type	YS
Hollow piston cylinder	
Manufacturer	Yale Industrial Products GmbH
Type	YCS

Note: Similar tools are admitted