PD CEN/TS 16920:2016

BSI Standards Publication

Environmental influence testing methodology for operational deployments of European ABC systems

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of CEN/TS 16920:2016.

The UK participation in its preparation was entrusted to Technical Committee IST/44, Biometrics.

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.

Published by BSI Standards Limited 2016

ISBN 978 0 580 91180 4
ICS 35.240.15

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2016.

Amendments/corrigenda issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16920

March 2016

ICS 35.240.15

English Version

Environmental influence testing methodology for operational deployments of European ABC systems

Méthodologie de tests de l'influence environnementale pour les déploiements opérationnels des systèmes européens de contrôle de passages aux frontières automatisés

Testmethodik für Umwelteinflüsse beim operationellen Einsatz von europäischen ABC-Systemen

This Technical Specification (CEN/TS) was approved by CEN on 25 January 2016 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TS 16920:2016 E

Contents

Page

European foreword

This document (CEN/TS 16920:2016) has been prepared by Technical Committee CEN/TC 224 "Personal identification and related personal devices with secure element, systems, operations and privacy in a multi sectorial environment", the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This Technical Specification is focused on the application of the testing methodology defined in ISO/IEC 29197 for analysing the influence of environmental conditions on the biometric performance of European automatic border control (ABC) systems according to the features of these systems, the specificities of these systems for the European context and their intended operational environment, i.e. airports and port halls.

ABC systems are automated systems which can verify the identity of travellers crossing the borders at the border crossing points, without the need for human intervention. These systems are used by many European countries for supporting border control officer activities. Their objective is to improve border crossing processes and achieve consistent security levels throughout Europe. As a consequence, it is required that these systems conform to ISO/IEC standards for interoperability (see CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, Clause 1). Among these standards, the multipart standard ISO/IEC 19795 "Biometric Performance Testing and Reporting" establishes requirements for planning, executing and reporting biometric performance evaluations. However, due to the fact that this set of standards does not cover the analysis of environmental conditions influence on biometric performance, ISO/IEC JTC1 SC37 WG5 began a new project for establishing a testing methodology to quantify those environmental effects. This project is ISO/IEC 29197 "Information technology — Evaluation methodology for environmental influence in biometric system performance".

However, this methodology is generic and its requirements have been specified to cover the analysis of several environmental parameters (e.g. temperature, humidity, atmospheric pressure, illumination, noise, etc.) considering all possible operational environments. Depending on the particular features of the biometric system under test and the expected operational environment, those requirements should be particularized.

European ABC systems have biometric modules which have common and well-defined features.

Firstly, European ABC systems may use one or a combination of three biometric modalities: facial, fingerprint and iris (as it is specified by CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 4.1). Therefore, there are certain environmental conditions that affect such modalities to a greater extent according to ISO/IEC/TR 19795-3.

On the other hand, European ABC systems are localized in specific environments such as airports, railway stations and sea ports (as it is mentioned in CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1.1). As a result, it is possible to predict which are going to be the surrounding environmental conditions of the ABC systems and to analyse whether the systems work properly or not for the possible values of such conditions. If the biometric performance of European ABC systems is affected by any environmental condition and this problem is not detected in early stages, it may cause negatively effects in future.

In addition, European ABC systems are subjected to privacy and data protection legislation (e.g. Directive 95/46/EC). Therefore, their analysis should comply with the limitations imposed by EU and data protection regulations (see CEN/TS 16634:2014, Personal identification— Recommendations for using biometrics in European Automated Border Control, 5.1.3.6 and 5.1.4).

Consequently and considering the importance to accurately check the correct behaviour of the biometric recognition functionality of European ABC systems in their expected host environment, it is essential to specify the general testing methodology addressed by ISO/IEC 29197 for the characteristics and needs of European ABC systems.

1 Scope

The purpose of this document is to specify the ISO/IEC 29197 testing methodology for European ABC systems. This specification will cover the following aspects:

— environmental conditions which influence biometric modalities used for European ABC systems, i.e. temperature, humidity, illumination and noise;

— different tests that can be defined regarding European ABC systems and the procedures for defining of the evaluation conditions to analyse per each test;

— particular characteristics of European ABC systems in accordance to best practice recommendations and privacy and data protection regulations for this kind of systems in case of European deployments.

As a consequence, the proposed document will include the following aspects:

— specific requirements for planning and executing environmental testing evaluations for European ABC systems based on ISO/IEC 29197 project and the best practices recommendations provided by CEN/TS 16634 Personal identification — Recommendations for using biometrics in European Automated Border Control document;

— recommendations for the selection of the possible tests according to the specific system that is going to be evaluated;

— specific requirements to establish and measure such evaluation conditions as well as to establish the baseline performance;

— a specification of the biometric performance evaluation including requirements for test population, test protocols, data to record and test results consistent with operational deployments of European ABC systems.

2 Normative references

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

CEN/TS 16634:2014, *Personal identification - Recommendations for using biometrics in European Automated Border Control*

ISO/IEC 29197:2015, *Information technology — Evaluation methodology for environmental influence in biometric system performance*

3 Terms and definitions

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

3.1
environmental conditions
all atmospheric parameters and other physical and chemical phenomena that can surround the European ABC system and influence on its performance

Note 1 to entry: The term "environmental conditions" entails more aspects than "ambient conditions". However, the term "ambient conditions" can also refer to conditions that occur naturally in contrast to conditions that have been induced. Therefore, it has been preferred to use the term "environmental conditions".

Note 2 to entry: It is important to distinguish two concepts related to this term:

— operational environment: the environmental conditions under which the European ABC system is expected to operate. This concept does not associate any predefined value;

— extreme conditions: environmental conditions that entail very high or very low values and may be hostile for systems operation or even human life.

3.2
environmental generator
equipment used to establish and maintain the controlled conditions of the test (e.g. an air conditioning system)

3.3
evaluation conditions
each of the evaluations carried out in a different evaluation environment to assess the performance of European ABC systems in one or more specific environmental conditions

3.4
evaluation configuration
physical layout of the environment in which the European ABC is going to be tested including the necessary equipments for performing tests

3.5
evaluation environment
environment in which the biometric system is evaluated considering the environmental conditions and the evaluation configuration

3.6
instrument
calibrated equipment used to measure and/or record environmental parameters (e.g. a thermometer)

3.7
parties involved in the evaluation
entities or organizations which are interested in the evaluation and have responsibilities in the evaluation process

Note 1 to entry: These entities are basically two: the test laboratory which is going to conduct the evaluation and the developer or customer who request to carry out the evaluation. In case the developer is different from the customer (e.g. an end-user requesting to know the performance of a commercial European ABC system), a third entity is added to the number of parties.

Note 2 to entry: Test subjects are not considered a party of the evaluation although they have to take part in it.

3.8
reference evaluation environment
REE
evaluation environment in which the European ABC system is analysed to obtain baseline performance metrics for making comparisons

3.9
target evaluation environment
TEE
evaluation environment in which the European ABC system is analysed to obtain performance metrics for studying the influence of certain environmental conditions, by comparing with the results obtained at the REE

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

ABC Automatic Border Control

REE Reference Evaluation Environment

TEE Target Evaluation Environment

5 Overview of evaluating the influence of ambient conditions in European ABC systems

5.1 Introduction to ISO/IEC 29197 evaluations

ISO/IEC 29197 defines a general evaluation methodology for analysing the influence of environmental conditions on biometric systems performance. The model established for this evaluation methodology entails to conduct an "end-to-end" ISO/IEC 19795-1:2006 biometric performance evaluation, i.e. a scenario evaluation or an operational evaluation in one or more predefined environments.

During the biometric performance evaluation in each evaluation environment, test subjects interact with the biometric system many times as it was required and both, the biometric system recognition outcomes and environmental conditions are recorded at the same time. From such results, it is possible to determine the biometric system performance (i.e. error rates and throughput rates) for the specific evaluation conditions.

For scenario evaluations, ISO/IEC 29197 addresses to conduct two (or more) scenario test: one in a Reference Evaluation Environment (REE) and another (or others) in the Target Evaluation Environments (TEEs). The evaluation environments will be identical, including the same test subjects, following the same procedures, except for the environmental conditions. The environmental conditions are specific of each evaluation environment. As a consequence, the comparison between results of the REE and the TEEs allows knowing whether the biometric system is influenced, or not, by any environmental parameter, as well as quantifying this influence. A schema of the evaluation methodology model is shown in Figure 1.

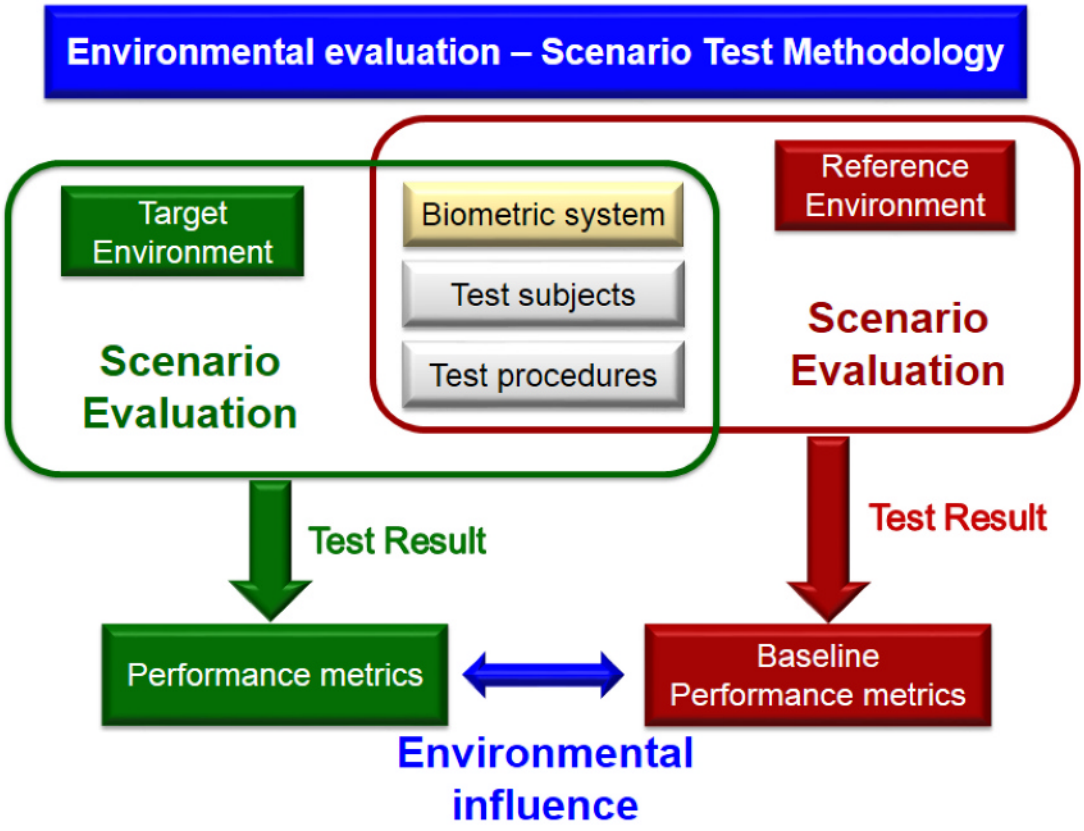

Figure 1 — Evaluation model for scenario evaluations

In case of an operational test, ISO/IEC 29197 addresses to determine a specific environment and select one or more environmental parameters to assess. Then an operational test is to be conducted in this environment. This approach provides insights into the degree to which biometric systems are influenced by the environmental conditions analysed for this particular environment.

5.2 Application of the ISO/IEC 29197 evaluation methodology to European ABC systems

5.2.1 General

The application of the ISO/IEC 29197 evaluation methodology to analyse the influence of the environmental conditions on the biometric performance of European ABC systems shall consider the special characteristics of this kind of systems and their intended operational environment. The following clauses describe these characteristics and relate to the relevant section of ISO/IEC 29197.

5.2.2 Environmental parameters influencing biometric performance of the European ABC systems

The most relevant parameters that influence the biometric performance of European ABC systems are the following:

— temperature and humidity. These parameters can influence to European ABC systems which use fingerprint biometrics;

NOTE 1 CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control addresses in 5.3 that the quality of an acquired image finger depends on the skin condition and also offers recommendations in order to avoid the halo effects in the captured fingerprint images when there is a difference between the finger and the sensor surface temperatures.

— illumination: illuminance and irradiance. This parameter could affect the three biometric modalities that can be used for a European ABC system: face, fingerprint and iris (See CEN/TS 16634 Personal identification- Recommendations for using biometrics in European Automated Border Control addresses in 4.1).

NOTE 2 CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control addresses in 5.2.4 the following: "Sunlight will vary both on a daily and on a seasonal basis. It is recommended to test that the system will perform adequately under different sunlight conditions. It is recommended that direct sunlight is avoided, and environmental illumination is controlled for best capture results".

As a consequence, the analysis of the influence of environmental conditions in case of European ABC systems shall include a test (or tests) that covers one or more of these environmental parameters. For each test, the evaluation conditions specification addressed by ISO/IEC 29197 evaluation methodology shall be in accordance with the environmental parameter to study in such a test.

5.2.3 Specific characteristics of biometric modules of the European ABC systems

Firstly, regarding the biometric functions, European ABC systems are biometric systems where the verification process is composed of two separate steps: capture and verification sub-processes (See CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1.2). Enrolment is usually a process that is carried out in previous steps, with a careful control of the overall process and usually at indoor conditions. Therefore, the application of ISO/IEC 29197 evaluation methodology to this kind of systems should not cover the enrolment process. If this process is necessary for the tests because it has not been done before, it should be conducted considering the standard conditions and only at REE in case of biometric performance scenario evaluations.

Also, there are two general types of European ABC systems in relation to their use of the biometric references, token-based or tokenless. The verification sub-process of a token based ABC system entails a verification (i.e. a 1:1 comparison) whereas the verification sub-process of a tokenless based ABC systems entails an identification (i.e. a 1:N comparison). As a result, the specification of the ISO/IEC 29197 methodology to these systems considers either verification or identification mechanisms.

Secondly, regarding the physical and user interface features, European ABC systems are biometric systems which may have different topologies and should follow certain recommendations for improving the quality of the acquired biometric samples and its usability (See CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1 to 5.4). The most relevant are related to the following aspects:

— localization of the capture unit;

— user guidance (i.e. visual and audible instructions and indications, etc); and

— feedback (i.e. displays, LEDs, etc).

Therefore, when applying the ISO/IEC 29197 evaluation methodology to European ABC systems, requirements for the test environment and for the guidance and training of the test crew shall be defined in accordance with these characteristics and recommendations.

Finally, regarding the biometric performance rates, European ABC systems should meet specific FAR and FRR error rates (See CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.2.2, 5.3.2 and 5.4.2). Consequently, results obtained when applying the ISO/IEC 29197 evaluation methodology shall be reported considering these values.

5.2.4 Privacy and data protection legislation of the European ABC systems

European ABC systems are systems subjected to privacy and data protection legislation (e.g. Directive 95/46/EC). Operational data stored in this kind of systems shall comply with the limitations imposed by EU and data protection regulations (See CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1.3.6 and 5.1.4). As a result, logging, data protection and privacy requirements shall be also applied to data collected and stored when conducting an ISO/IEC 29197 evaluation in case of these systems.

6 Evaluation conditions specification

6.1 Introduction

The first step for performing an ISO/IEC 29197 evaluation is to define the evaluation conditions. This process entails two tasks which depend on the type of biometric performance tests (i.e. scenario and operational evaluations).

For scenario evaluations these tasks are the definition of the environmental parameters to be assessed and controlled, and the specification of the measuring points and set points for such parameters considering the different evaluation environments (i.e. REE and TEE) and the different biometric functions (i.e. enrolment and verification/identification).

Regarding operational evaluations, these tasks are the definition of the environmental parameters to be assessed and the specification of the expected operational range for such parameters.

Parties involved in the evaluation shall select which of these tests want to conduct and specify some options that will depend on the particular ABC system to test and the objectives of the evaluation (e.g. whether it is known the expected operational environment or not, the facilities for carrying out the evaluation).

6.2 Tests for the environmental influence evaluation of European ABC systems

6.2.1 General

ISO/IEC 29197 establishes three different kinds of evaluations: one type for the analysis of the influence of one, a second type for the analysis of the influence of a combination of environmental parameters, and a third type for the analysis of the influence of a specific evaluation environment. This clause defines tests regarding the first and the third types of evaluations including the second type a special case of the third type of evaluation.

6.2.2 Tests for analysing the influence of one environmental parameter

6.2.2.1 Overview

These tests are used to analyse the influence of one environmental parameter on biometric system performance separately. For conducting them, it is recommended to define a set of evaluation conditions (i.e. REE and TEEs) and carry out a biometric performance scenario evaluation in each condition. As a result, these tests have been defined considering the ISO/IEC 29197 model for scenario evaluations.

In general, the environmental parameters to assess have been selected according the parameter to be studied (i.e. temperature, humidity or illumination) respectively. In addition, the value of this parameter has been selected according to possible extreme conditions.

NOTE Extreme conditions entail extreme operational environments for which it is essential to study whether European ABC systems are able to work properly or not.

Likewise, the environmental parameters to control have been selected considering the rest of environmental parameters that may affect a European ABC system in a greater extent (See 5.2.1). The values for these conditions have been set to the standard conditions values.

6.2.2.2 Evaluation conditions for each test

6.2.2.2.1 General requirements

All tests shall meet the following requirements:

— the values of the environmental parameters to assess and control for enrolment and verification/identification processes at the REE shall be the standard conditions values addressed in 6.2.2.2.2;

— the values of the environmental parameters to control for verification/identification processes at the TEE shall be the standard conditions values addressed in 6.2.2.2.2;

— the values of the environmental parameters to assess for verification/identification processes at the TEE shall be specified in accordance to the values for each type of test established in 6.2.2.2.3 for temperature tests, 6.2.2.2.4 for humidity tests and 6.2.2.2.5 for illumination tests.

NOTE Enrolment process at the TEE is not covered (See 5.2.3).

6.2.2.2.2 Specification of the standard conditions

In accordance to ISO/IEC 29197, the standards conditions shall be the values given in Table 1.

Table 1 — Standard conditions

Temperature	23 °C ± 3 °C
Relative Humidity	40 % to 60 %
Illuminance	300 lx to 1500 lx

6.2.2.2.3 Evaluation conditions for temperature tests

The objective of this kind of tests is to study the influence of the temperature. For this kind of tests, the parameters defined in Table 2 shall be specified.

Table 2 — Evaluation conditions for temperature tests

Test	**Parameters to assess (mandatory)**	**TEE Measuring point**	**Parameters to control (optional)**	**TEE Set point**
Test Name	Temperature	T [°C]	Humidity	RH [%]
			Illumination	Illuminance [lx] Irradiance [W/m^2]

Firstly, the evaluation conditions for each temperature test shall be identified by means of a test name. Also, the temperature measuring point shall be set. In addition, if any optional parameter to control is included in the evaluation, the set point for this parameter shall be set.

EXAMPLE This example shows how to define two different temperature tests called cold and hot tests respectively. The evaluation conditions for each test are given in Table 3.

Table 3 — Example of evaluation conditions specification for temperature tests

Test	Parameters to assess	TEE Measuring points	Parameters to control	TEE Set points
Cold	Temperature	0 °C < T < 5 °C	Humidity	Between 40 % to 60 %
			Illumination	Illuminance between 300 lx to 1500 lx
Hot	Temperature	28 °C < T < 35 °C	Humidity	Between 40 % to 60 %
			Illumination	Illuminance between 300 lx to 1500 lx

For this example, values have been established according to [3]. The lower temperatures in the Earth are less than −32 °C for cold climates in winter and more than 40 °C for hot climates in summer. However, these extreme values are harmful to human beings if they are exposed to them without any protection during certain time [4]. Therefore, the values for these tests have been selected considering ranges in which the cold effects (i.e. vasoconstriction) and the warm effects (i.e. perspiration and vasodilatation) happen but not such extreme values.

6.2.2.2.4 Evaluation conditions for humidity tests

The objective of this kind of tests is to study the influence of the relative humidity. For this kind of tests, the parameters defined in Table 4 shall be specified.

Table 4 — Evaluation conditions for humidity tests

Test	Parameters to assess (mandatory)	TEE Measuring point	Parameters to control (optional)	TEE Set point
Test Name	Humidity	RH [%]	Temperature	T [°C]
			Illumination	Illuminance [lx] Irradiance [W/m²]

Firstly, the evaluation conditions for each humidity test shall be identified by means of a test name. Also, the relative humidity measuring point shall be set. In addition, if any optional parameter to control is included in the evaluation, the set point for this parameter shall be set.

EXAMPLE This example shows how to define a humidity tests for high levels of relative humidity. The evaluation conditions for each test are given in Table 5.

Table 5 — Example of evaluation conditions specification for humidity tests

Test	Parameters to assess	TEE Measuring points	Parameters to control	TEE Set points
High Relative Humidity	Humidity	70 % < RH < 90 %	Temperature	Between 20 °C to 26 °C
			Illumination	Illuminance between 300 lx to 1500 lx

For this example values have been established considering the relative humidity levels that are present in tropical areas.

6.2.2.2.5 Evaluation conditions for illumination tests

The objective of this kind of tests is to study the influence of the illumination. For this kind of tests, the parameters defined in Table 6 shall be specified.

Table 6 — Evaluation conditions for illumination tests

Test	Parameters to assess (mandatory)	TEE Measuring point	Parameters to control (optional)	TEE Set point
Test Name	Illumination	Illuminance [lx] Irradiance [W/m^2]	Temperature	T [°C]
			Humidity	RH [%]

Firstly, the evaluation conditions for each illumination test shall be identified by means of a test name. Also, the illumination measuring point shall be set. In addition, if any optional parameter to control is included in the evaluation, the set point for this parameter shall be set.

EXAMPLE This example shows how to define three different illumination tests considering direct sunlight, indirect sunlight and dim light situations. The evaluation conditions for each test are given in.

Table 7 — Example of evaluation conditions specification for illumination tests

Test	Parameters to assess	TEE Measuring points	Parameters to control	TEE Set points
Direct sunlight	Illumination	Illuminance > 25000 lx	Temperature	Between 20 °C to 26 °C
			Humidity	Between 40 % to 60 %
Indirect sunlight	Illumination	10000 lx < Illuminance < 25000 lx	Temperature	Between 20 °C to 26 °C
			Humidity	Between 40 % to 60 %
Dim light	Illumination	Illuminance < 150 lx	Temperature	Between 20 °C to 26 °C
			Humidity	Between 40 % to 60 %

For this example illumination tests have been defined trying to cover different conditions depending on the where European ABC systems are placed (i.e. in full sun, in the shade, in locations with little light, etcetera). For sunlight tests, values have been selected considering the range of illuminance measurements from the sun of daylight under partly cloudy sky given in [5]. The direct sunlight test establishes a value of illuminance higher than such range, whereas the indirect sunlight test sets the value of illuminance in this range. For the dim light test, the value of illuminance has been selected according to values given in EN 12464-1:2011 [6] for crossing areas (e.g. corridors, stairs) where visual tasks are not usually carried out and the light needed is limited.

6.2.3 Tests for analysing the influence of a specific environment

6.2.3.1 Overview

These tests are used to analyse the influence of a combination of environmental parameters (e.g. temperature and humidity) or to analyse the influence of a specific operational environment.

This type of test is open to study the influence on biometric performance of any operational environment in which a European ABC systems may work. In general, the values of the conditions to analyse are the values measured/expected for the host environment during certain period of time.

For conducting this type of test it is possible to carry out both types of "end-to-end" biometric performance evaluation: scenario or operational.

NOTE 1 In scenario evaluations the environment is a modelled environment. This environment is controlled and the evaluations can be reproducible. However, it is necessary to define and assess the biometric system in a REE in addition to in the TEE.

NOTE 2 In operational evaluations the environment is the real environment. This environment is an uncontrolled environment and evaluations cannot be reproducible. However, the evaluations are operationally more realistic.

6.2.3.2 Evaluation conditions for this kind of tests

When conducting scenario evaluations, this kind of tests shall meet the following requirements: the environmental parameters to assess shall be at least two parameters of the following group: temperature, humidity or illumination:

— the environmental parameters to control are optional. It may be any parameter of the aforementioned group that has not been defined as a parameter to asses or may be another parameter such as noise;

— the values of the environmental parameters to assess and control for enrolment and verification/identification processes at the REE shall be the standard conditions values specified in 6.2.2.2.2;

— the values of the environmental parameters to control for verification/identification processes at the TEE shall be the standard conditions specified in 6.2.2.2.2;

— the values of the environmental parameters to assess for verification/identification processes at the TEE shall be in accordance to host environment. That is, these values shall be similar to *in situ* measurements. If it is not possible to obtain these measurements, the MIL-STD-810 G standard [3] distinguishes four climate conditions (i.e. basic, hot, cold and severe cold) and provides details about their localization and the most typical values for each of them. When measuring or selecting these values, it is recommended to consider the seasonal variations of the climate and/or the time of the day variations and analyse those cases that are more critical (e.g. summer, winter, rainy season, or the time of the day in which the sunlight received is higher).

NOTE Enrolment process at the TEE is not covered (See 5.2.3).

However, when conducting a biometric performance operational evaluation, this kind of test shall meet the following requirements:

— the environmental parameters to assess shall be at least two parameters of the following group: temperature, humidity or illumination;

— if the objective is to study certain values or ranges of the environmental parameters to asses, these values shall be specified;

— if it is necessary to perform the enrolment, it shall be conducted at the standards conditions specified in 6.2.2.2.2.

6.3 Recommendations for the selections of the tests

As it was previously mentioned, the precise tests to be conducted for testing the influence of environmental conditions on the biometric system performance of a European ABC system shall be selected by parties involved in the evaluation. For this selection, the next recommendations should be followed:

— tests for analysing the influence of one environmental parameter should be conducted when the final operational environment for a European ABC system is unknown but it is necessary to predict whether the biometric performance diminishes or not for certain environmental conditions. Once this type of tests has been selected, the specific test to carry out should be selected considering the biometric modality that is used by the European ABC system under test and its biometric capture device:

  — temperature and humidity tests should be conducted when the European ABC system to test is based on fingerprint;

  — illumination tests should be conducted when the European ABC system to test is based on face or iris recognition. Also for fingerprint when the biometric capture device is affected by the illumination (e.g. optical sensors);

— test for analysing the influence of a specific environment should be conducted when the final operational environment is known previously and it is possible to obtain the environmental conditions values for such environment:

  — for European ABC systems that are going to be placed indoors (i.e. airports or seaports halls) but close to windows, one of the environmental parameter to assess should be illumination;

  — for European ABC systems that are going to be placed outdoors it is recommended that the environmental parameters to assess should be the three most influential factors: temperature, humidity and illumination.

6.4 Recommendations for the selection of specific values

Considering the recommendations for the selection of different test, this clause provides recommendations for the specification of the measuring and set points especially for analysing the influence of a specific environment.

Regarding temperature and humidity values, the different climate zones around the world, 5 different combinations can be distinguished [3]. Each value will correspond to a different test. Table 8 provides the environmental conditions that shall be established for each test.

Table 8 — Temperature and humidity combinations regarding different climatic zones

Test	Parameters to assess	Measuring points
Severe cold	Temperature	T < −15 °C
	Humidity	RH > 70 %
Cold	Temperature	−15 °C < T < 5 °C
	Humidity	RH > 70 %
Hot dry	Temperature	30 °C < T < 40 °C
	Humidity	RH < 40 %
Hot humid	Temperature	30 °C < T < 40 °C
	Humidity	RH > 70 %
Basic humid	Temperature	20 °C < T < 26 °C
	Humidity	RH > 75 %

Regarding the combination of temperature, humidity and illumination values, the most challenging situations will be winter and summer seasons at different light conditions. The recommended values for these possible situations are defined in Table 9.

Table 9 — Temperature, humidity and illumination combinations regarding different seasons

Test	Parameters to assess	Measuring points
Outdoors cloudy severe winter	Temperature	T < −15 °C
	Humidity	RH > 70 %
	Illumination	10000 lx < Illuminance < 25000 lx
Outdoors sunny severe winter	Temperature	T < −15 °C
	Humidity	RH > 70 %
	Illumination	Illuminance > 25000 lx
Outdoors cloudy winter	Temperature	- 15 °C < T < 5 °C
	Humidity	RH > 70 %
	Illumination	10000 lx < Illuminance < 25000 lx
Outdoors sunny winter	Temperature	−15 °C < T < 5 °C
	Humidity	RH > 70 %
	Illumination	Illuminance > 25000 lx
Outdoors hot-humid cloudy summer	Temperature	30 °C < T < 40 °C
	Humidity	RH > 70 %
	Illumination	10000 lx < Illuminance < 25000 lx
Outdoors hot-humid sunny summer	Temperature	30 °C < T < 40 °C
	Humidity	RH > 70 %
	Illumination	Illuminance > 25000 lx
Outdoors hot-dry cloudy summer	Temperature	30 °C < T < 40 °C
	Humidity	RH < 40 %
	Illumination	10000 lx < Illuminance < 25000 lx
Outdoors hot-dry sunny summer	Temperature	30 °C < T < 40 °C
	Humidity	RH < 40 %
	Illumination	Illuminance > 25000 lx

7 Requirements for biometric performance testing of ABC system when conducting ISO/IEC 29197 evaluations

7.1 Test crew demographic characteristics

Persons that typically use a European ABC systems are travellers above 18 years old. Therefore, the test crew for analysing the environmental conditions influence shall be composed for test subjects that meet this condition. Then, considering other factors a generic population shall be recruited for the experiments. Nevertheless it is recommended that this population will be balanced according to the gender and age factors of common travellers. See Table 10. Other characteristics of the target population shall be considered when defining the test crew in order to achieve a well balanced evaluation (e.g. height).

Table 10 — Test crew composition

Age	18 to 35	36 to 60	Above 60
	20 - 35 %	30 - 50 %	20 - 35 %
Gender	40 - 60 % Males	40 - 60 % Males	40 - 60 % Males
	40 - 60 % Females	40 - 60 % Females	40 - 60 % Females

7.2 Acclimatization

For testing environments that entails extreme conditions, or the TEE conditions are very different to the ambient conditions present at the evaluation time, acclimatization procedures shall be executed. Test subjects need to adapt his biometric characteristic and behaviour to the evaluation environment in order to carry out a presentation as realistic as possible.

Regarding European ABC systems, two situations shall be considered:

— when travellers are exposed all the time to the ambient conditions wearing the appropriate clothes;

— when travellers change for a short time from comfortable conditions (e.g. a heated car) to ambient conditions just for using the ABC system.

Considering these circumstances, test subjects shall conducted biometric transactions at the TEE modelling both situations.

For the first case, test subjects shall be exposed to the TEE conditions during a predefined period of time dressed with clothes similar to those that they use for this kind of environmental conditions. Then, they shall conduct the biometric transactions at TEE conditions.

For the second case, test subjects shall not be acclimatized for the TEE conditions. They shall be exposed to standard conditions for a predefined period of time and then change these conditions to TEE conditions just when they are going to conduct the biometric transactions.

The specific time that test subjects shall be exposed to TEE conditions or standard conditions respectively shall be reported.

Bibliography

[1] Best Practice Technical Guidelines for Automated Border Control (ABC) Systems, Frontex, Warsaw, August 2012, Version 2.0

[2] Best Practice Operational Guidelines for Automated Border Control (ABC) Systems, Frontex, Warsaw, August 2012, Version 2.0

[3] United States Military Standards, Department of Defense: Test Method Standard for Environmental Engineering Considerations and Laboratory Test, MIL-STD-810 G, 2008.

[4] Oficina Internacional del Trabajo, Enciclopedia de Salud y Seguridad en el Trabajo, 3ªed., Ministerio de Trabajo y Asuntos Sociales 1998.

[5] ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA. *The Lighting Handbook*. Illuminating Engineering, Ninth Edition, 2000

[6] EN 12464-1:2011, *Light and lighting - Lighting of work places - Part 1: Indoor work places*

[7] ISO/IEC 19795-1:2006, *Information technology — Biometric performance testing and reporting — Part 1: Principles and framework*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.