



THE GLOBAL STANDARD  
FOR LIVESTOCK DATA

# Section 10 - Guidelines for Testing and Certification of Animal Identification Devices

Section 10 – Identification Device Certification  
Version October, 2017

**Network. Guidelines. Certification.**

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# Table of Contents

1	Background .....	7
1.1	Foreword .....	7
1.2	Test categories.....	7
1.2.1	RFID Conformance test (ISO 24631-1) .....	7
1.2.2	RFID Performance test (ISO 24631-3).....	7
1.2.3	Device Composition and Environmental Performance test (ICAR).....	7
1.3	Scope and formal steps for achieving an ICAR certification of identification devices.....	8
1.4	Test centres.....	9
1.5	Publication of test results.....	9
1.6	Conditions for the use of ICAR certificates .....	9
2	Transponder Conformance including manufacturer code .....	9
2.1	Foreword .....	9
2.2	Introduction .....	9
2.3	References.....	10
2.4	Application.....	10
2.4.1	Full Test.....	10
2.4.2	Limited Test.....	10
2.4.3	Listing Update .....	11
2.4.4	Application .....	11
2.5	Testing Process.....	11
2.6	Provision of results .....	11
2.7	Conditions for use of ICAR conformance test certificate .....	12
2.8	Granting and use of a manufacturer code .....	13
2.8.1	Allocation of shared and unshared manufacturer code .....	13
2.8.2	Manufacturer Code Application Procedure .....	13
2.8.3	Conditions for the right to use the manufacturer code.....	14
2.8.4	The use of Manufacturer codes and Country codes .....	14
3	Conformance of synchronizing and non-synchronizing transceivers .....	14
3.1	Scope.....	14
3.2	References.....	14
4	Conventional plastic ear tag testing and certification.....	14
4.1	Introduction .....	14
4.2	Scope.....	15
4.3	References.....	16
4.4	Definitions.....	16
4.4.1	Certification code.....	16
4.4.2	Certified ear tag .....	16
4.4.3	Ear tag .....	16
4.4.4	Manufacturer .....	17
4.4.5	Reference colour .....	17
4.4.6	Reference number .....	17
4.4.7	Test code.....	17
4.4.8	Tested Ear tag .....	17
4.5	Testing and certification procedure .....	17
4.5.1	Phase 1: Manufacturer's application.....	17

4.5.2	Phase 2: Preliminary assessment.....	18
4.5.3	Phase 3: Laboratory Test - Technical Evaluation.....	18
4.5.4	ICAR conditions for certification of conventional permanent plastic ear tags.....	19
5	External RFID device testing and certification.....	20
5.1	Introduction .....	20
5.2	Scope.....	21
5.3	References.....	21
5.4	Definitions.....	22
5.4.1	Certification code.....	22
5.4.2	Certified RFID device.....	22
5.4.3	Manufacturer.....	22
5.4.4	Reference colour .....	22
5.4.5	Reference ID codes.....	22
5.4.6	RFID ear tag.....	22
5.4.7	RFID leg tag .....	23
5.4.8	Tested RFID device.....	23
5.5	ICAR Testing and Certification Procedure.....	23
5.5.1	Phase 1: Manufacturer's Application .....	23
5.5.2	Phase 2: Preliminary Assessment.....	23
5.5.3	Phase 3 Laboratory Test - Technical Evaluation.....	24
5.5.4	ICAR conditions for certification of permanent external RFID devices .....	25
5.6	List of ICAR certified devices.....	26
6	Annex A1. Application for RFID transponder Conformance test (ISO 24631-1).....	26
7	Annex A2. Application for a manufacturer code allocation .....	26
8	Annex A3. Code of conduct.....	26
9	Annex A4. Application for RFID transponder Performance test (ISO 24631-3) .....	26
10	Annex A5. Application for RFID transceiver Conformance test (ISO 24631-2) .....	26
11	Annex A6. Application for RFID transceiver Performance test (ISO 24631-4).....	27
12	Annex B1. Application for Device Composition and Environmental Performance test for conventional ear tags .....	27
13	Annex B2. Application for Device Change Notification (DCN) for conventional ear tags modified during the 5-year certification .....	27
14	Annex B3. Sets of figures to be used as reference printing .....	28
15	Annex B4. Phase 2 Preliminary Test for Plastic Tags.....	28
15.1	Ear tag design .....	28
15.2	Locking mechanism checks.....	28
15.3	Application test .....	28
15.4	Resistance of the locking system.....	29
16	Annex B5. Phase 3 Laboratory Test Procedure for Plastic Tags .....	29
16.1	Assessment of descriptive parameters .....	29
16.2	Composition.....	30
16.2.1	Characteristics of the ear tag plate plastic .....	30
16.2.2	Harmful substances.....	30
16.3	Pre-treatments .....	31
16.3.1	Acid bath treatment .....	31

16.3.2	Alkaline bath treatment.....	31
16.3.3	Ageing by damp heat and cold .....	31
16.3.4	Resistance to artificial ageing.....	31
16.3.5	Abrasive treatment .....	31
16.4	Performance Assessment .....	32
16.4.1	Typography readability.....	32
16.4.2	Evaluation of colour contrast change.....	32
16.4.3	Evaluation of machine readability (optional) .....	32
16.5	Evaluation of the resistance of the locking system .....	34
17	Annex C1. Application for Device Composition and Environmental Performance test for external RFID devices .....	34
18	Annex C2. Application for Device Change Notification (DCN) for external RFID devices modified during the 5-year certification .....	35
19	Annex C3. Phase 2 Preliminary Assessment for External RFID Devices.....	35
19.1	RFID ear tags .....	35
19.1.1	Ear tag design .....	35
19.1.2	Electronic readability check .....	35
19.1.3	Locking mechanism checks.....	35
19.1.4	Application test .....	35
19.1.5	Resistance of the locking system .....	36
19.2	RFID leg tags .....	37
19.2.1	Leg tag design.....	37
19.2.2	Electronic readability check .....	37
20	Annex C4. Phase 3 Laboratory Test for External RFID Device. ....	37
20.1	Assessment of descriptive parameters .....	37
20.1.1	Weight and dimensions .....	37
20.2	Composition.....	37
20.2.1	Characteristics of the plastic of the ear or leg tag.....	38
20.2.2	Harmful substances.....	38
20.3	Performance assessment.....	38
20.3.1	Initial readability test .....	39
20.3.2	Resistance to artificial ageing.....	39
20.3.3	Resistance to tensile loading.....	39
20.3.4	Resistance to impact of free fall .....	40
20.3.5	Resistance to cold .....	40
20.3.6	Resistance to dry heat .....	40
20.3.7	Resistance to damp heat and cold.....	41
20.3.8	Typography readability.....	41
20.3.9	Evaluation of colour contrast change.....	41

## Tables

Table 1. Categories for the testing of identification devices.....	8
Table 2. Steps, actions and responsibilities to receive ICAR certification.....	9
Table 3. References to ISO standards. ....	10

Table 4. References to ISO standards for testing and certification of plastic ear tags. ....	16
Table 5. ISO references for testing and certification of external RFID devices.....	21
Table 6. Sets of figure to be used as reference printing. ....	28
Table 7. Pre-treatments and ensuing performance assessments for conventional plastic tags. ....	31
Table 8. Minimum performance standards for bar-code scanning. ....	33
Table 9. Performance assessment of external RFID device.....	39

## Change Summary

<b>Date of Change</b>	<b>Nature of Change</b>
August 17	Reformatted using new template.
August 17	Table of contents added.
August 17	Heading numbers and heading text edited for clarity and removal of redundant text.
August 17	Remove annexes and replace with links to same material on other parts of the ICAR website.
August 17	Move Phase 3 test procedure of conventional plastic tag to own section as an annex – B5.
August 17	Turn track changes off. Accept all changes. Turn track changes on.
August 17	Move phase 2 and phase 3 test procedures for RFID devices to own sections as an annex – C4 and C5 respectively.
August 17	Add list of tables to table of contents.
August 17	Turn track changes off. Accept all changes. Turn track changes on.
August 17	Rephrased the sentence “ <i>Should the manufacturer fail to meet any or all of the above conditions (see <a href="#">here</a> for misuse reporting form) for the use of the ICAR certificate, actions may be taken by ICAR upon the receiving of the form for misuse reporting</i> ” since it contained a wrong link. No legal actions can be taken by ICAR, except the removal of the device from the web list of the certified ones.
August 17	Accept all changes. Generated the new Table of Content and then left track changes on.
August 17	Moved all technical steps for conventional tag testing to annexes – B4 and B5. Accept all changes.
August 17	Include edits from Andie.
August 17	Accepted all changes and applied the new template provided by Joost on 29 Aug.

Oct. 2017	Hyperlinks have been corrected
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## 1 Background

### 1.1 Foreword

This section provides a general introduction to the principles and procedures developed for testing and certification of animal identification devices by ICAR.

On June 22, 2007 ISO appointed ICAR as the Registration Authority (RA) competent to register manufacturer codes used in the radio frequency identification (RFID) of animals in accordance with ISO 11784 and ISO 11785.

ICAR has administrative procedures in place for testing the conformance of RFID devices in respect to ISO 11784 and ISO 11785. Only those results emanating from accredited and RA-approved test centres are recognized. In addition, ICAR offers evaluations on various quality and performance features of those same devices subjected to the ICAR conformance test and these evaluations are also available for conventional plastic eartags.

### 1.2 Test categories

Testing of identification devices can be subdivided into three main categories (Table 1).

#### 1.2.1 RFID Conformance test (ISO 24631-1)

Conformance testing is required to demonstrate electronic transponders meet the specifications and standards in ISO 11784 and ISO 11785. The submission of identification devices to conformance testing is obligatory before they can be used in the official identification of animals.

Conformance tests are coordinated by Service-ICAR. Acting as the Registration Authority (RA) on behalf of ISO, ICAR issues a Certificate of Conformance for RFID devices conforming with ISO 11784 and ISO 11785.

#### 1.2.2 RFID Performance test (ISO 24631-3)

Performance testing is an evaluation of the following characteristics of an RFID device: modulation amplitude, bit length stability, minimum activation field strength resonance frequency and amplitude voltage response (V<sub>ss</sub>). These RFID performance test results are not subject to pass or fail criteria but provide useful additional information on device behaviour when communicating with a reader. Acting as the Registration Authority (RA) on behalf of ISO, ICAR evaluates RFID devices through the RFID performance test and issues an evaluation report to the submitting manufacturer accordingly.

#### 1.2.3 Device Composition and Environmental Performance test (ICAR)

ICAR offers a device composition and environmental performance test for both conventional plastic and RFID external devices. The objective of these tests is to give extensive information on device durability and performance in diverse animal management conditions. Procedures will vary depending on the device type. ICAR issues an evaluation report and ICAR certificate for devices in accordance with the specifications of the respective ICAR standards described in sections 4 and 5.

*Table 1. Categories for the testing of identification devices.*

<b>Test category</b>	<b>Test description</b>
Application	Application <i>(for any kind or combination of identification devices)</i>
	Laboratory Test
Conformance ISO 24631-1	Transponder conformance <i>(granting of manufacturer code)</i>
Performance ISO 24631-3	Transponder performance
Composition and environmental performance	Extended laboratory test <i>(for any kind or combination of identification devices)</i>

### 1.3 Scope and formal steps for achieving an ICAR certification of identification devices

This section describes and summarises the ICAR rules and procedures applied in the testing of identification devices including both RFID devices and conventional plastic eartags. ICAR certification of identification devices is outlined below and illustrated in Table 1 and Table 2.

- a. A manufacturer applies a test for certification or re-certification of an identification device. The application consists of a letter and an application form, which must be sent to the Service-ICAR secretariat.
- b. The application forms are available [here](#) on the ICAR website.
- c. Service-ICAR confirmation of admittance to participate and issuance of test contract.
- d. Financial transactions between manufacturers, test centres and ICAR are coordinated by Service ICAR.
- e. The manufacturer will send all the necessary devices and accessories to the test centre carrying out the tests. The devices and accessories remain the property of ICAR.
- f. The test centre will test the devices as described in the respective test protocols.
- g. The test centre will prepare a confidential report of the test results and will send the report to the Service-ICAR secretariat.
- h. Service-ICAR will send the test report to the manufacturer and, in the case of a successful test result, an official ICAR letter of certification signed by the ICAR Chief Executive will also be sent to the manufacturer. For other tests not subjected to pass or fail criteria, an official ICAR letter acknowledging the completion of those evaluation will be sent to the manufacturer.
- i. ICAR will publish all ICAR certified products along with their test reference number(s) on the ICAR website. When the validity of the ICAR certification has expired for an RFID device, the device will no more appear in the ICAR certified products webpage but continue to be listed in the RA registered devices webpage. A photograph of the identification device will accompany the online product list of both the ICAR certified webpage and the ICAR registered webpage.

The devices tested and certified for material composition and environmental performance will remain in the ICAR web list only the 5-years validity period of the certified device.

*Table 2. Steps, actions and responsibilities to receive ICAR certification.*

<b>Step</b>	<b>Action</b>	<b>Responsibility</b>
1	Application for participation in testing of devices	Manufacturer or dealer of identification device
2	Confirmation of admittance to participate and issuance of test contract	Service-ICAR
3	Testing and report compilation	ICAR test centres
4	Advice of test results to the device submitting entity	Service-ICAR
5	ICAR certification	ICAR

#### 1.4 Test centres

Test procedures must be conducted by accredited and RA approved test centres ([list here](#)). Each test is contracted by Service-ICAR to a specific test centre. The test centre is obliged to act according to the procedures laid down within the test protocols. In addition, all details associated with the testing phase, including the test results must be kept strictly confidential. Test centres are regularly monitored by the ICAR Animal Identification Sub-Committee ([details here](#)).

#### 1.5 Publication of test results

ICAR certifications and advice of successful and / or completed tests are published [here](#) on the ICAR website.

#### 1.6 Conditions for the use of ICAR certificates

Every certificate issued by ICAR is valid for 5 years and commits the manufacturer to a list of validation conditions.

If a device is certified by ICAR, the manufacturer may publish the certification of its device. ICAR certification does not guarantee the device is suitable for all environments.

While an ICAR certificate is valid for 5 years, the registration of an RFID device is unlimited and all registered RFID devices will be listed on the ICAR website.

**Note:** A manufacturer must not use the ICAR logo for any purpose.

## 2 Transponder Conformance including manufacturer code

### 2.1 Foreword

ISO 11785 defines the test protocols for evaluating and verifying both the conformance and performance of RFID devices and ISO 11784 the code structure. Only those results emanating from accredited and RA-approved test centres are recognized.

### 2.2 Introduction

ISO 11784 and ISO 11785 cover four RFID device types used for animal identification:

- a. **Injectables:** a small transponder able to be injected into an animal's body. The transponder is encapsulated in a biocompatible and non porous material, e.g. glass.

- b. **Ear tag:** a plastic covered transponder able to be fixed to an animal's ear using a locking mechanism which prevents the device from being removed without damaging it and rendering it unusable.
- c. **Ruminal bolus:** a transponder placed into a high specific gravity container orally administered to a ruminant animal where the device remains in the stomach of the animal due its high specific gravity which prevents its passing through the animal's digestive system.
- d. **Tag attachment:** a transponder covered by a primary protection layer but without its own locking system and is used only as an attachment to a visual ear tag or to another means of external animal identification, e.g. leg tag, collar, etc.

The tests carried out by ICAR as RA are recognised by the Federation of European Companion Animals Veterinary Association ([FECAVA](#)) and [WSAVA](#) (World Small Animal Veterinarian Association) and as such can be applied to companion animals also.

The fee for all tests will be borne by the applicant.

## 2.3 References

*Table 3. References to ISO standards.*

ISO 11784	Agricultural equipment - Radio frequency identification of animals - Code structure
ISO 11785	Agricultural equipment - Radio frequency identification of animals - Technical concept
ISO 3166	Codes for the representation of names of countries and their subdivisions

The latest version of ISO Standards will always apply and these Standards can be downloaded from the ISO website ([www.iso.org](http://www.iso.org)).

## 2.4 Application

A manufacturer can apply for:

- a. A full test.
- b. A limited test.
- c. A listing update.

### 2.4.1 Full Test

A full test is mandatory in the following cases:

- d. When a non-RA registered manufacturer applies for a test.
- e. When a RA registered manufacturer uses a new silicon chip (Integrated Circuit) or implements new technology (HDX or FDX-B) in the transponder;
- f. When a RA registered manufacturer changes the coil technology (ferrite coils vs. air coils).

### 2.4.2 Limited Test

A limited test is applicable in the following cases:

- a. When a RA registered manufacturer inserts an ICAR certified transponder into a different primary transponder package.
- b. When a RA registered manufacturer uses the silicon chip of an ICAR certified transponder with different coil dimensions.
- c. When a RA registered manufacturer inserts an ICAR certified transponder with its original primary packaging into a different secondary packaging, e.g. a glass transponder into a bolus or a glass transponder into an ear tag.

#### 2.4.3 Listing Update

Listing update is applicable when a RA registered manufacturer intends to use an ICAR certified transponder without any modification. In this case the applicant must deliver a copy of the original test report along with a written confirmation from the ICAR registered manufacturer who originally submitted the transponder under question for certification by ICAR.

#### 2.4.4 Application

To apply for an ISO transponder conformance test the manufacturer has to complete the test application form ([Annex 1](#)) given on the ICAR web site [here](#) and accompanied with a letter of the applicant. The application forms can also be obtained from the Service-ICAR secretariat.

The completed application must be emailed in PDF format to the Service-ICAR secretariat. The email address of the Service-ICAR secretariat is: [manufacturers@icar.org](mailto:manufacturers@icar.org).

### 2.5 Testing Process

The manufacturer has the right to choose their preferred ICAR accredited test centre. The manufacturer is required to send:

- a. 50 transponders to the test centre for a full test, or
- b. 10 transponders for a limited test, or
- c. 10 transponders for a listing update.

The submitted transponders must have the ICAR test code of 999 or the existing manufacturer's code for a full test. The manufacturer can freely choose the transponder codes, but duplicate codes are not allowed. The manufacturer must provide a list of the transponder codes in decimal format.

The test centre will test the transponders for compliance with ISO 11784 and ISO 11785. All tested transponders must be readable by the laboratory reference transceiver. The codes read by the laboratory reference transceiver must comply with ISO 11784 and the identification codes must be on the list of codes provided by the manufacturer.

### 2.6 Provision of results

The test centre will prepare a confidential report of the test results and will send the report to the Service-ICAR secretariat. For a limited test or a listing update, the test report will contain only a summary of the test results.

Service-ICAR will send the test report to the manufacturer and, in the case of a successful Conformance test result, an official ICAR letter of certification signed by the ICAR Chief Executive will also be sent to the manufacturer with a copy to the ISO/TC23/SC19/WG3 secretariat.

ICAR as RA issues a product code for each type of transponder successfully tested, including the listing update.

All electronic transponders submitted in an application will be kept by the test centre as reference transponders.

ICAR as RA maintains a public register ([link here](#)) on the ICAR website which lists all products registered and ICAR certified. A photograph of the certified device is included in the listing.

#### 2.7 Conditions for use of ICAR conformance test certificate

Upon successful completion of the Conformance test, ICAR will grant a device certificate valid for five years and a certification reference number.

The ICAR certification of a transponder confirms the transponder's compliance with the code structure and the technical concepts given in ISO 11784 and ISO 11785.

The manufacturer must maintain a database register of all ICAR certified transponders sold. The manufacturer must require the initial purchasers of their ICAR certified transponders to also maintain a database register of their purchased product and require all subsequent purchasers to do the same until the transponder is applied to an animal.

The ICAR certificate is valid only for the transponder successfully tested and certified by ICAR. A manufacturer must not utilise the ICAR certificate and / or the certification reference number for a transponder:

- a. Which is not manufactured by them; and / or
- b. Which does not comply in all respects with the ICAR certificate and the certification reference number, including (but not limited to):
  - Maintaining identical packaging (both primary and secondary) of the certified transponder.
  - Maintaining identical technology and manufacturer of the certified transponder.
  - Maintaining the identical transponder to the certified transponder.
- c. Which utilises the manufacturer code of another manufacturer.
- d. Which is supplied to or intended to be supplied to a person ("the receiver") who will market the transponder as if manufactured by them, unless:
  - The receiver has obtained ICAR registration under this process.
  - The transponder bears either the shared manufacturer code or the unshared manufacturer code of the receiver.

Once the ICAR certification has been granted, the manufacturer will be responsible to:

- a. Keep an accurate and detailed log of all changes to their product and this log must be available to ICAR upon request. This log must include details of in-house performance measurements and Quality Assurance testing showing the amended product has maintained or enhanced its quality and performance.
- b. Submit the product for re-certification before the expiration of its current ICAR certification. The manufacturer must submit this product no earlier than 6 months before the expiration of the certificate and no later than 5 months before the expiration of the certificate.

- c. Understand that ICAR may take sample products from the marketplace and test its conformance against the conformance of the device the manufacturer originally submitted should ICAR suspect a breach of the signed ICAR Code of Conduct ([available here](#)) or a product change that has not been subjected to the tests outlined in Section 2.4 on page 10 of this document.

Should the manufacturer fail to meet any or all of the above conditions (see [here](#) for misuse reporting form) for the use of the ICAR certificate, actions may be taken by ICAR upon the receiving of the form for misuse reporting.

In cases of disputes regarding the conditions listed above or the use of an ICAR certificate, the decision of ICAR as RA will be binding.

ICAR as RA will distribute an advice notice regarding any manufacturer that distributes transponders in conflict with the certificate procedure.

## 2.8 Granting and use of a manufacturer code

According to ISO 11784 "*... it is a national responsibility to ensure the uniqueness of the national identification code*". Where countries have not undertaken efforts to set up a procedure for the allocation and registration of the national identification code, a manufacturer code must be used instead of a country code to ensure a worldwide uniqueness of identification codes. ISO has appointed ICAR as the RA to allocate manufacturer codes in conformance with ISO 11784.

### 2.8.1 Allocation of shared and unshared manufacturer code

#### 2.8.1.1 Shared manufacturer code

A manufacturer code can be granted to more than one manufacturer and this code is known as a shared manufacturer code. A shared manufacturer code can be granted by ICAR as RA if the manufacturer's RFID device has successfully completed a full conformance test. When a shared manufacturer code is granted, ICAR as RA also allocates a restricted set of identification codes for exclusive use with the shared manufacturer code. The identification codes allocated in combination with the shared manufacturer code are unique. ICAR as RA must ensure this uniqueness by applying appropriate procedures for the assignment and registration of allocated identification codes. If necessary, additional sets of identification codes can be assigned to the manufacturer by request. The size of the sets of allocated identification codes is determined on consensual agreement with the manufacturer and ICAR.

#### 2.8.1.2 Unshared manufacturer code

An unshared manufacturer code will only be granted to a manufacturer providing proof to the Registration Authority that during two consecutive years the company has sold a minimum of one million (ICAR certified) transponders per year. This proof must be sourced from their sales records and certified by their external auditor of accounts or a notary public.

### 2.8.2 Manufacturer Code Application Procedure

A manufacturer who applies to conformance test and certify an RFID device for the first time has to also apply for a manufacturer code and sign the "[Code of conduct](#)".

The first full test application must consist of a letter, a completed test application form ([Annex A1](#)) a completed application form for a manufacturer code ([Annex A2](#)) and the signed "Code of conduct" ([Annex A3](#)). By signing the application form and the code of conduct the

manufacturer agrees to fulfil the conditions described in this document and to accept the charges for this procedure.

The completed application must be emailed in PDF format to the Service-ICAR secretariat. The email address of the Service-ICAR secretariat is: [manufacturers@icar.org](mailto:manufacturers@icar.org)

The Service-ICAR secretariat will inform the manufacturer of the acceptance or rejection of their application. A copy of this communication will also be sent to the secretariat of ISO/TC23/SC19/WG3.

ICAR maintains a public register listing all registered manufacturers and the shared/unshared manufacturer codes granted.

#### 2.8.3 Conditions for the right to use the manufacturer code

The manufacturer can only use their manufacturer code for products registered by ICAR as RA.

In disputes regarding the conditions of manufacturer code use, the decision of ISO/TC 23/SC19 will be binding.

For further reference, ISO 11784 can be downloaded from the ISO website ([www.iso.org](http://www.iso.org)).

#### 2.8.4 The use of Manufacturer codes and Country codes

Manufacturer codes (900-998 series) should only be used in connection with electronic identification (RFID) devices, in accordance with ISO 11784 and Section 10 of these Guidelines, including [Annex A3 Code of Conduct](#).

Where a competent national authority has assumed the responsibility for ensuring and maintaining the uniqueness of the RFID identification code for a specific species in that country, the ISO 3166 3-digit numeric country code may be used in place of the manufacturer code in the electronic identity or RFID of that specific species of animal.

The use of manufacturer codes in the International Identity used for genetic evaluation purposes is discouraged (Refer to [Section 9](#) of the ICAR Guidelines).

## 3 Conformance of synchronizing and non-synchronizing transceivers

### 3.1 Scope

This section outlines the procedures to verify the compliance of RFID transceivers to the operating characteristics outlined in ISO 11784 and ISO 11785. ISO details the protocols for evaluating transceivers.

### 3.2 References

Refer to Table 3 above.

## 4 Conventional plastic ear tag testing and certification

### 4.1 Introduction

This section will guide the manufacturer through the steps of initially obtaining and then retaining ICAR certification for a conventional permanent plastic ear tag.

The ICAR procedures for testing the performance and reliability of permanent identification devices considers, but is not limited, to the following issues:

- a. Ease of application and use.
- b. Efficiency of animal recognition.
- c. Durability and tamperproof quality.
- d. Animal welfare and human health.

The following procedures focus on testing the ear tag design, the print quality and, if requested, the ear tag machine readability.

The testing procedure is composed of three distinct phases:

- a. Phase 1: Manufacturer's application (Section 4.5.1 on page 17).
- b. Phase 2: Preliminary Assessment (Section 4.5.2 on page 18).
- c. Phase 3: Laboratory Test - Technical Evaluation (Section 4.5.3 on page 18 and Annex B5 in Section 16 on page 29).

These test procedures must be carried out by an ICAR accredited test laboratory. The fees for these test procedures will be borne by the device manufacturer.

When an ear tag is certified by ICAR, the manufacturer will be authorized to state that tags of that particular design and printing method are ICAR certified. ICAR certification does not imply that the tag is suitable for all environments or that its machine-readable characteristics are satisfactory for all uses. It is the manufacturer's responsibility to comply with the requirements of the relevant jurisdictions.

A successfully tested product can have its certification withdrawn if the product fails to comply with the requirements described in this section. ICAR and/or national authorities may randomly take samples of certified tags from the market and subject them to testing to ensure certified ear tags continue to meet ICAR certification criteria. The manufacturer will be required to meet the costs of these assessments should the product fail to meet ICAR standards.

The manufacturer must advise ICAR of any sub-standard performance of ICAR certified products not in accordance with their previous test results. The manufacturer must also inform ICAR of any change to the composition or the print quality of a certified ear tag.

Users of ear tags and / or potential users of ear tags are encouraged to access the list of certified tags found [here](#) on the ICAR website.

## 4.2 Scope

This section describes the evaluation procedures for measuring the composition and the performance of conventional permanent plastic ear tags which may include machine readable printing.

When a manufacturer submits an ear tag to ICAR for testing, they may also choose to have the machine readability of the ear tag evaluated according to this protocol. If no request is made to evaluate the machine readable printing of the submitted ear tag, then only the visual readability will be evaluated.

Successful completion of the procedures described in this section will result in the ICAR certification of the ear tag as a device recommended by ICAR for animal identification purposes. ICAR certified ear tags are published on the ICAR website as certified visual identification devices.

## 4.3 References

*Table 4. References to ISO standards for testing and certification of plastic ear tags.*

ISO 175	Resistance of thermoplastics to liquids
EN 1122	Plastics - Determination of cadmium - Wet decomposition method
ISO 1817	Resistance of vulcanized elastomers to liquids
ISO 4650	Rubber - Identification - Infrared spectrometric method
ISO 9924	Determination of composition of vulcanized elastomers
ISO 11357	Plastics - Differential scanning calorimetry (DSC)
ISO 9352	Plastics - Determination of resistance to wear by abrasive wheels
ISO 527-1	Plastics - Determination of tensile properties part 1: General principles
ISO 37	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
ISO 4611	Plastics - Determination of the effects of exposure to damp heat, water spray and salt mist
EN ISO 4892-2	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps
EN ISO 4892-3	Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps
ISO 15416	Information technology - Automatic identification and data capture techniques - Bar code print quality test specification; Linear symbols
ISO 11664-4	Colorimetry - Part 4: CIE 1976 L*a*b* Colour space
ISO 7724	Paints and Varnishes – Colorimetry

The latest version of the above references will always apply

## 4.4 Definitions

## 4.4.1 Certification code

A certification code is an alpha-numeric code consisting of "C" (for certified), followed by three numbers. The certification code is used to identify and register an ear tag model that has successfully passed the testing procedure. This code may be embossed on all ICAR certified ear tags for official identification. The placement of the certification code on the ear tag should conform to the relevant jurisdictional requirements in whatever locality the ear tag is sold.

## 4.4.2 Certified ear tag

A certified ear tag is an ear tag described in the Application Form that was submitted to the ICAR accredited test centre where it successfully passed the testing procedures and was thus certified by ICAR.

## 4.4.3 Ear tag

An ear tag is deemed to be composed of three principal features:

- a. The front plate which is often, but not always, the "female" component of an ear tag combination. The front plate is designated as such because it will be in the front of the animal's ear when the ear tag combination is applied correctly.
- b. The rear plate which is often, but not always, the "male" component of an ear tag combination. The rear plate is designated as such because it will be at the back of the animal's ear when the ear tag combination is applied correctly.
- c. The locking mechanism which comprises of the locking gap in the female component of an ear tag and the pin of the male component of the ear tag combination.

#### 4.4.4 Manufacturer

The manufacturer is the company or person submitting the application for the testing of an ear tag and has accepted the ICAR conditions for certification of conventional permanent plastic ear tags as outlined in Section 4.5.4 on page 19.

#### 4.4.5 Reference colour

The colour of the ear tags used in the laboratory tests must be yellow and the colour of the printing must be black. The manufacturer must print a uniform solid block 10mm x 10mm in the same colour as the colour of the printing on the tag.

#### 4.4.6 Reference number

Printing must be composed of four different and predefined figures (from 0 to 9) as outlined in Annex B3 on page 28 below. The font style and size must replicate precisely the font style and size the manufacturer commonly uses on that tag within the market.

For the ear tags where machine readability will be assessed a 12 digit barcode must be printed on the tags in addition to the reference number. The 12 digit barcode consists of the three numbers of the test code as defined in in Annex B3 (page 28 below) followed by zeroes and the reference number.

#### 4.4.7 Test code

The test code is an alpha-numeric code consisting of "T" (for tested), followed by 3 numbers.

The test code is used to identify and register an eartag model being tested in the field under the approval procedure. This code must be printed or engraved on all eartags undergoing testing during the approval procedure.

#### 4.4.8 Tested Ear tag

A tested ear tag is an ear tag described in the Application Form that was submitted to the ICAR accredited test centre and subsequently tested.

### 4.5 Testing and certification procedure

#### 4.5.1 Phase 1: Manufacturer's application

To submit an ear tag for ICAR testing within the scope of the tests described in this section, the manufacturer must complete an application and email it in PDF format to the Service-ICAR secretariat. The email address of the Service-ICAR secretariat is: [manufacturers@icar.org](mailto:manufacturers@icar.org)

The application must consist of:

- a. A letter of application.
- b. An Application Form ([Annex B1](#) and [Annex B2](#) if applicable).
- c. Annex B1 is the application form for the certification of a new device or re-certification of an already certified device.
- d. Annex B2 is the application form for the certification of a device modified during its certification.

Copies of the required application forms can be obtained from the ICAR website or from the ICAR secretariat.

When a manufacturer chooses to have the machine readable printing on the ear tag evaluated, the manufacturer must indicate this choice on the completed Application Form. The application should also specify the symbols (language) used on the tag, e.g. Quick Response (QR) Model 2, Data Matrix (DM) ECC 200, Aztec, Code 128, Code 39 or Interleaved 2 of 5. The applicant should also indicate if the AIM (Automatic Identification Manufacturers International Inc) quality standards (code dimensions) have been met.

By signing the application form, the manufacturer agrees to fulfil the conditions of ICAR testing, certification and payment obligations and also acknowledges the ongoing monitoring and assessments for certified ear tags.

#### 4.5.2 Phase 2: Preliminary assessment

To assess conformance of the ear tags with the information given in the application form and to also detect any major failure, e.g. damage of the tag at application, possible unlocking without deformation, inappropriate animal welfare design etc. the ear tags will be submitted to a Preliminary Assessment.

The Preliminary Assessment procedure is also applied to a device for which the manufacturer is requesting re-certification.

##### 4.5.2.1 Manufacturer requirements

At the commencement of the Preliminary assessment the manufacturer must deliver:

- a. A sample of 120 ear tags marked with the reference printing applied using the same technique and style as used (or intended to be used) in the commercially marketed tags. Note: Tags used in this phase are likely to be destroyed during testing
- b. An additional 10 male components (pins) used to check reusability of broken and / or unfastened female ear tags.
- c. Two pairs of tag applicators or equivalent devices supplied for the application of tags to animals.

##### 4.5.2.2 Phase 2 Preliminary assessment

Refer to Annex B4 (Section 15 on page 28) for details.

##### 4.5.2.3 Conclusion of the Preliminary assessment

The test centre will prepare a comprehensive report detailing the results of the submitted ear tag's performance in the Phase 2 Preliminary Assessment. This report will be submitted to ICAR who will then forward the test report to the manufacturer.

If the Phase 2 testing is successful, then the manufacturer will be asked to confirm their willingness to proceed to the Phase 3 Laboratory test.

If a device has not performed satisfactorily, ICAR will provide the manufacturer with the test report and indicate the reasons for the tag's failure.

#### 4.5.3 Phase 3: Laboratory Test - Technical Evaluation

##### 4.5.3.1 Assigning a test centre

Following the successful completion of the Preliminary Assessment and the decision of the manufacturer to proceed to the Phase 3 Laboratory Test, Service-ICAR will assign one of the accredited test centres to carry out the Phase 3 Laboratory Test

#### 4.5.3.2 Granting of a test code

A specific test code will be allocated by ICAR for the ear tag undergoing testing. The manufacturer will be advised of the test code and the manufacturer must print or engrave this code on each ear tag produced for the Phase 3 Laboratory Test.

#### 4.5.3.3 Manufacturer requirements

At the commencement of Phase 3, the manufacturer must deliver the following items to the assigned test centre (in addition to the items listed in Section 4.5.2.1):

- a. 200 yellow ear tags with the test code number and the reference printing applied (including the uniform solid block described in 4.4.5. For tags where the machine readability is to be assessed, a 12 digit barcode must also be printed on the ear tag. Note: the manufacturer will be allocated 25 reference numbers to print on the 200 ear tags, i.e. 8 tags per reference number (Annex B3 on page 28).
- b. A statement specifying the nature of the polymer used for the ear tag, e.g. thermoplastic elastomers, vulcanized elastomer etc.

#### 4.5.3.4 Test procedure

The test procedures to be followed for Phase 3: Laboratory Test – Technical Evaluation is described in Annex B5 (Section 16 on page 29 below).

#### 4.5.3.5 Conclusion of the laboratory test

The test centre will prepare a test report and will submit it to Service-ICAR which will then forward it to the ICAR Sub-Committee for Animal Identification for comment. All information collected during the laboratory tests will remain confidential and only disclosed to the manufacturer of that ear tag.

Upon the successful completion of the Phase 3 Laboratory Testing, ICAR will send the test report and an official letter to the manufacturer granting ICAR certification for that ear tag.

If the manufacturer had requested an evaluation on the machine readability of the ear tag, then this evaluation will also be included in the test report.

Each test report on a successfully tested tag will include a summary sheet with an evaluation of the appropriate suitability of the ear tag for various production systems and / or environmental conditions.

If the Phase 3 Laboratory Test results are unsatisfactory, ICAR will send the manufacturer the test report indicating the reasons for the failure.

#### 4.5.4 ICAR conditions for certification of conventional permanent plastic ear tags

- a. Upon successful completion of the ICAR test procedures described in in Annex B5 (Section 16 on page 29 below), ICAR will grant a device certificate valid for five years and a certification reference number.
- b. This certification is valid only for the specific plastic ear tag type successfully tested and certified by ICAR.
- c. A manufacturer cannot utilise the ICAR certification for a plastic ear tag:
  - Which is not manufactured by them; or
  - Which does not comply in all respects to the ICAR certification which includes maintaining an identical tag type to the certified tag.

- d. Once the ICAR certificate has been granted, the manufacturer will be responsible to:
  - Keep an accurate and detailed log of all changes to their product and this log must be available to ICAR upon request. This log must include details of in-house performance measurements and Quality Assurance testing showing the product has maintained or enhanced its quality, performance and material composition.
  - Submit the product for re-certification before the expiration of its current ICAR certification. The manufacturer must submit this product no earlier than 6 months before the expiration of the certificate and no later than 5 months before the expiration of the certificate.
  - Understand that ICAR may take sample products from the market and test its conformance against the conformance of the device the manufacturer originally submitted should ICAR suspect a breach of the signed ICAR Code of Conduct or a product change that has not been subjected to the tests outlined in Section 4.5.3 on page 18 of this document.
- e. Should the manufacturer fail to meet any or all the above certification conditions ICAR may withdraw the certification.
- f. In disputes regarding the conditions above or the use of a certificate, the decision of ICAR will be binding.
- g. ICAR will distribute an advice notice regarding any manufacturer distributing product in conflict with the testing and certification procedures outlined in this Section 4.

## 5 External RFID device testing and certification.

### 5.1 Introduction

This section will guide the manufacturer through the steps of initially obtaining and then retaining ICAR certification for an external permanent radio frequency identification (RFID) device.

The ICAR procedure for testing the performance and reliability of external permanent RFID devices considers, but is not limited to the following issues:

- a. Ease of application and use.
- b. Efficiency of animal recognition.
- c. Durability and tamperproof quality.
- d. Animal welfare and human health.

Only external RFID devices designed as permanent electronic identification devices are covered in this Section 5.

The testing procedure is composed of three distinct phases:

- a. Phase 1: Manufacturer's Application (Section 5.5.1).
- b. Phase 2: Preliminary Assessment (Section 5.5.2).
- c. Phase 3: Laboratory Test - Technical Evaluation (Section 5.5.3).

These test procedures must be carried out by an ICAR approved test laboratory. The fees for these test procedures will be borne by the device manufacturer.



A tested and certified product can have its certificate withdrawn if the product fails to comply with the requirements described in this section. ICAR and/or national authorities may randomly take samples of certified tags from the market and subject them to appropriate testing to ensure certified ear tags continue to meet ICAR standards. The manufacturer will be required to meet the costs of these assessments should the product fail to meet ICAR standards.

The manufacturer must advise ICAR of any sub-standard performance of ICAR certified products not in accordance with their previous test results. The manufacturer must also inform ICAR of any change to the composition of a certified RFID device.

ICAR certification does not imply that the external RFID device is suitable for all environments or that its read performance is satisfactory for all uses. Where RFID devices are intended for use in animal identification schemes, it is the manufacturer responsibility to comply with the requirements of the relevant jurisdiction.

Users of external RFID devices and / or potential users of external RFID devices are encouraged to access the list of certified RFID devices found [here](#) on the ICAR website.

## 5.2 Scope

This section describes the evaluation procedures for measuring the composition and the performance of external RFID devices.

Successful completion of the procedures described in this section will result in the ICAR certification of the tested RFID device as a device recommended by ICAR for animal identification purposes. ICAR certified RFID devices are published on the ICAR website.

## 5.3 References

*Table 5. ISO references for testing and certification of external RFID devices.*

EN 1122	Plastics - Determination of cadmium - Wet decomposition method
ISO 4650	Rubber - Identification - Infrared spectrometric method
ISO 9924	Determination of composition of vulcanized elastomers
ISO 11357	Plastics - Differential scanning calorimetry (DSC)
ISO 527-1	Plastics - Determination of tensile properties part 1: General principles
ISO 37	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
ISO 11664-4	Colorimetry - Part 4: CIE 1976 L*a*b* Colour space
ISO 7724	Paints and Varnishes – Colorimetry
EN ISO 4892-2	Plastics - Methods of exposure to laboratory light sources Part 2: Xenon-arc lamps
EN/IEC 60068-2-1	Environmental testing - Part 2-1: Tests - Test A: Cold
EN/IEC 60068-2-2	Environmental testing - Part 2-2: Tests - Test B: Dry heat
EN/IEC 60068-2-32	Environmental testing - Part 2-32: Tests - Test Ed: Free fall
ISO 4611	Plastics - Determination of the effects of exposure to damp heat, water spray and salt mist
ISO 11785	Radio frequency identification of animals - Technical concept
ISO 24631-1	Radio frequency identification of animals - Part 1: Evaluation of conformance of RFID transponders with ISO 11784 and ISO 11785
ISO 24631-3	Radio frequency identification of animals - Part 3: Evaluation of performance of RFID transponders conforming with ISO 11784 and ISO 11785

The latest version of the above references will always apply.

## 5.4 Definitions

### 5.4.1 Certification code

A certification code is an alpha-numeric consisting of "C" (for certified), followed by three numbers. The certification code is used to identify and register an RFID device that has successfully completed the testing procedure. This code may be embossed or printed on all ICAR certified RFID devices for official identification. The placement of the certification code should conform to the relevant jurisdictional requirements in whatever the locality the RFID device is sold.

### 5.4.2 Certified RFID device

A certified RFID device is an RFID device described in the Application Form that was submitted to the ICAR accredited test centre where it successfully passed the testing procedures and was thus certified by ICAR.

### 5.4.3 Manufacturer

The manufacturer is the company or person submitting the application for the testing of an RFID device and has accepted the conditions of ICAR for the certification of external RFID devices as outlined in Section 5.5.4.

### 5.4.4 Reference colour

The colour of the external RFID device used in the laboratory tests must be yellow and the colour of the printing must be black. On the test samples, preferably on the rear part, the manufacturer must print a uniform solid block of 10mm x 10mm in the same colour as the colour of the printing on the device. Should the surface area of the device be too small to accommodate the printing of a 10mm x 10mm solid block, then a uniform solid block of 5mm x 20mm is acceptable. This printing may be on the female tag plate or on the male tag plate (sometimes known as the pin).

### 5.4.5 Reference ID codes

The transponders of the RFID devices submitted to the laboratory test must be programmed with the test code of 999 followed by zeroes and a sequential numerical code as per the following:

- a. For the Phase 2 Preliminary Assessment, the sequential numerical code range will be: 001 - 120.
- b. For the Phase 3 Laboratory Test, the sequential numerical code range will be: 201 - 400.
- c. The reference ID code programmed into each transponder must be printed on the front part of each device. The font style and size must replicate precisely the font style and size the manufacturer commonly uses on that device within the market. This font size and style must be specified in the application form.

### 5.4.6 RFID ear tag

An RFID ear tag is a radio frequency identification (RFID) external device able to be fixed to an animal's ear and deemed to be composed of three principal features:

- a. The front part which is often, but not always, the "female" component of an ear tag combination. The front part is designated as such because it will be in the front of the animal's ear when the ear tag combination is applied correctly. It will often, but not always, contain the transponder.
- b. The rear plate which is often, but not always, the "male" component of an ear tag combination. The rear plate is designated as such because it will be at the back of the animal's ear when the ear tag combination is applied correctly.
- c. The locking mechanism which comprises of the locking gap in the female component of an ear tag and the pin of the male component of an ear tag combination.

#### 5.4.7 RFID leg tag

An RFID leg tag is a radio frequency identification (RFID) external device able to be permanently fastened to an animal's lower leg.

#### 5.4.8 Tested RFID device

A tested RFID device is a device described in the Application Form that was submitted to the ICAR approved test centre and subsequently tested.

### 5.5 ICAR Testing and Certification Procedure

#### 5.5.1 Phase 1: Manufacturer's Application

To submit an external RFID device for ICAR testing within the scope of the tests described in this section, the manufacturer must complete an application and email it in PDF format to the Service-ICAR secretariat. The email address of the Service-ICAR secretariat is: [manufacturers@icar.org](mailto:manufacturers@icar.org)

The application must consist of:

- a. A letter of application.
- b. An Application Form ([Annex C1](#) or [Annex C2](#)).
- c. Annex C1 form is the application form for the certification of a new device.
- d. Annex C2 is the application form for the certification of a device that has been modified during its certification period.

Copies of the required application form can be obtained from the ICAR website or from the ICAR secretariat.

By signing the application form, the manufacturer agrees to fulfil the conditions of ICAR testing, certification and payment obligations and also acknowledges the ongoing monitoring and assessments applicable for certified RFID devices.

#### 5.5.2 Phase 2: Preliminary Assessment

##### 5.5.2.1 Manufacturer requirements

At the commencement of the Preliminary Assessment the manufacturer must deliver:

- a. A sample of 120 RFID devices programmed with the reference ID codes and the reference printing. The printing must be applied using the same technique and style as used (or intended to be used) in the commercially marketed devices. Note: Devices used in this phase are likely to be destroyed during testing.

- b. An additional 10 male components (pins) used to check reusability of broken and / or unfastened female devices.
- c. Two pairs of device applicators or equivalent devices supplied for the application of devices to animals.

#### 5.5.2.2 Test procedures

Refer to detailed test procedure in section 19 on page 35.

#### 5.5.2.3 Conclusion of the Preliminary assessment

The test centre will prepare a comprehensive report detailing the results of the submitted external RFID devices' performance in the Phase 2 Preliminary Assessment. This report will be submitted to ICAR who will then forward the test report to the manufacturer.

If the Phase 2 testing is successful, then the manufacturer will be asked to confirm their willingness to proceed to the Phase 3 Laboratory Test.

If a device has not performed satisfactorily, ICAR will provide the manufacturer with the test report and indicate the reasons for the device's failure.

#### 5.5.3 Phase 3 Laboratory Test - Technical Evaluation

##### 5.5.3.1 Assigning a Test Centre

Following the successful completion of the Preliminary Assessment and the decision of the manufacturer to proceed to the Phase 3 Laboratory Test, Service-ICAR will assign one of its approved test centres to carry out the Phase 3 Laboratory Tests. The manufacturer's preferred approved test centre may be taken into consideration.

##### 5.5.3.2 Granting of a Test Code

A specific test code will be allocated by ICAR for the RFID device undergoing testing. The manufacturer will be advised of the test code and the manufacturer must print or engrave this code on each device produced for the Phase 3 Laboratory Test.

##### 5.5.3.3 Manufacturer Requirements

At the commencement of Phase 3, the manufacturer must deliver the following items to the assigned test centre (in addition to the items listed in Section 5.5.2.1):

- a. 200 external RFID devices programmed with the reference ID codes and the reference printing. One tag applicator or an equivalent device supplied for the application of devices to animals.
- b. A statement specifying the nature of the polymer used for the RFID device, e.g. thermoplastic elastomers, vulcanized elastomer etc.

##### 5.5.3.4 Conduct Laboratory Test

Refer to detailed test procedure in section 20 on page 37.

##### 5.5.3.5 Conclusion of the laboratory tests

The test centre will prepare a test report and will submit it to Service-ICAR which will then forward it to the ICAR Sub-Committee for Animal Identification for comment. All information collected during the laboratory tests will remain confidential and only disclosed to the manufacturer of that RFID device.

Upon the successful completion of the Phase 3 Laboratory Testing, ICAR will send the test report and an official letter to the manufacturer granting ICAR certification for that RFID device.

Each test report on a successfully tested RFID device will include a summary sheet with an evaluation of the appropriate suitability of the RFID device for various production systems and / or environmental conditions.

If the Phase 3 Laboratory Test results are unsatisfactory, ICAR will send the manufacturer a test report indicating the reasons for the failure.

#### 5.5.4 ICAR conditions for certification of permanent external RFID devices

- a. Upon successful completion of the ICAR test procedures described in this Section 5, ICAR will grant a device certificate valid for five years and a certification reference number.
- b. The certification is valid only for the specific external RFID device type successfully tested and certified by ICAR.
- c. A manufacturer cannot utilise the ICAR certification for an RFID device:
  - Which is not manufactured by them; or
  - Which does not comply in all respects to the ICAR certification (but not limited to):
    - Maintaining identical technology and the manufacturer of the certified tag;
    - Maintaining an identical RFID device to the certified tag;
- d. Once the ICAR certification has been granted, the manufacturer will be responsible to:
  - Keep an accurate and detailed log of all changes to their product and this log must be available to ICAR upon request. This log must include details of in-house performance measurements and Quality Assurance testing showing the product has maintained or enhanced its quality, performance and material composition.
  - Submit the product for re-certification before the expiration of its current ICAR certification. The manufacturer must submit this product no earlier than 6 months before the expiration of the certificate and no later than 5 months before the expiration of the certificate.
  - Understand that within the 5 year timeframe, ICAR may take sample products from the market and test its conformance against the conformance of the device the manufacturer originally submitted should ICAR suspect a breach of the signed ICAR Code of Conduct or a product change that has not been subjected to the tests outlined in Section 5 of this document.
- e. Should the manufacturer fail to meet any or all above certificate conditions ICAR may withdraw the certification.
- f. In disputes regarding the conditions above or the use of a certificate, the decision of ICAR will be binding.
- g. ICAR will distribute an advice notice regarding any manufacturer distributing RFID devices in conflict with the testing and certification procedures outlined in this Section 5.

5.6 List of ICAR certified devices

The list of ICAR Certified devices is available [here](#) in the ICAR website in the appropriate pages.

6 [Annex A1. Application for RFID transponder Conformance test \(ISO 24631-1\)](#)

The form for a test of ISO RFID conformance of transponders is available [here](#) on ICAR site.

The completed application form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) .

7 [Annex A2. Application for a manufacturer code allocation](#)

This Annex A2 has to be submitted only when a manufacturer applies the first ISO conformance test)

The form for applying for a manufacturer code allocation is available [here](#) on ICAR site.

The completed application form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) .

8 [Annex A3. Code of conduct](#)

To be submitted only when a manufacturer applies the first ISO conformance test.

The complete form for the Code of conduct is available [here](#) on ICAR web.

The completed form for the Code of conduct has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) .

9 [Annex A4. Application for RFID transponder Performance test \(ISO 24631-3\)](#)

The application form for a RFID transponder performance test is available [here](#) on ICAR web site.

The completed form for the Code of conduct has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) .

10 [Annex A5. Application for RFID transceiver Conformance test \(ISO 24631-2\)](#)

The application form for a conformance test of synchronizing transceivers is available [here](#) on ICAR website.

The completed form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) .

11 [Annex A6. Application for RFID transceiver Performance test \(ISO 24631-4\)](#)

The application form for conformance test for non-synchronising transceivers is available [here](#) on ICAR web.

The completed form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) ..

12 [Annex B1. Application for Device Composition and Environmental Performance test for conventional ear tags](#)

The form for an ICAR test on official permanent identification devices (conventional plastic ear tags) is available [here](#) on ICAR web site.

The completed form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org).

13 [Annex B2. Application for Device Change Notification \(DCN\) for conventional ear tags modified during the 5-year certification](#)

The form for the Device Change Notification is available [here](#) on ICAR web site.

The completed form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org) .

## 14 Annex B3. Sets of figures to be used as reference printing

*Table 6. Sets of figure to be used as reference printing.*

<b>Set-No.</b>	<b>Digits</b>
1	8080
2	7117
3	3883
4	5656
5	8808
6	3383
7	1717
8	3038
9	9989
10	4949
11	9444
12	2727
13	2772
14	7222
15	1441
16	1114
17	1414
18	5665
19	6555
20	1234
21	5678
22	9012
23	0888
24	8998
25	8999

## 15 Annex B4. Phase 2 Preliminary Test for Plastic Tags

### 15.1 Ear tag design

Ear tags shall have smooth, rounded corners and no sharp edges or protrusions specifically on the shaft of the piercing pin. The following measurements will be taken:

- a. The weight of the complete locked ear tag.
- b. The dimensions of the front and rear plate (height, width and thickness).
- c. The pin (length and diameter).
- d. The entrance hole of the cap.

Values and observations potentially impacting on animal welfare will be reported.

### 15.2 Locking mechanism checks

The primary purpose of these tests is to verify that the male to female locking mechanism, once correctly applied using the supplied applicator, cannot be subsequently dismantled in such a way that would allow the tag to be re-used. A locked ear tag should be tamperproof so tampering with the locked tag will render the tag unusable.

### 15.3 Application test

The application evaluation will be carried out using two groups of tags:

Group 1: 80 tags with the front and rear tag components locked together but without being inserted through ears

Group 2: 40 tags applied and locked into ears obtained post slaughter.

The performance level required for the 120 ear tags shall be:

- a. Successful locking of the front and rear tag components of all ear tags.
- b. No breakage of any tag component at locking.
- c. No deformation of any tag component after locking.
- d. No unlocking without breakage or irreparable damage to the ear tag.

The test centre will also check the rotation of the tag components on the locked tags. The following characterisation will be used:

- a. Tag components rotate freely.
- b. Tag components rotate but not freely.
- c. Tag components do not rotate.

#### 15.4 Resistance of the locking system

The 80 ear tags of Group 1 will be divided into four groups of 20 tags. These four groups will be subjected to increasing forces to determine the force required to cause breakage or unfastening of the ear tag. The forces will be applied at a speed rate of 500 mm/min. The force applied to cause breakage or unfastening of each ear tag will be recorded. Broken or unfastened tags must not be re-useable.

- a. Group 1: axial test at ambient conditions ( $21^{\circ}\text{C} \pm 2^{\circ}$ )
- b. Group 2: axial test at  $55^{\circ}\text{C} \pm 2^{\circ}$ , the forces will be applied immediately after the tags are removed from the heating or climatic chamber
- c. Group 3: transverse test at ambient conditions ( $21^{\circ}\text{C} \pm 2^{\circ}$ )
- d. Group 4: transverse test at  $55^{\circ}\text{C} \pm 2^{\circ}$ , the forces will be applied immediately after the tags are removed from the heating or climatic chamber.

#### **Requirements**

- a. Broken or unfastened tags must not be re-useable.
- b. At ambient conditions, axially tested tags designed to be used in cattle shall not break or unfasten with the application of a force lower than 280 Newton.
- c. At ambient conditions, axially tested tags designed to be used in sheep and / or goats shall not break or unfasten with the application of a force lower than 200 Newton.
- d. The number of tags unlocked without breakage or sustaining permanent damage during the transverse test is recorded, and broken or unfastened tags must not be re-useable.

## 16 Annex B5. Phase 3 Laboratory Test Procedure for Plastic Tags

### 16.1 Assessment of descriptive parameters

The parameters describing the ear tag will be assessed and compared to the information provided in the Application Form to ensure accuracy of description.

**Weight and dimensions:**

The following measurements will be taken:

- a. The weight of the complete locked ear tag
- b. The dimensions of the front and rear plate (height, width and thickness)
- c. The pin (length and diameter)
- d. The entrance hole of the cap

The results of these measurements will be compared to the Preliminary Assessment test report to ensure the accuracy of the samples.

## 16.2 Composition

Because ear tags are attached to "food producing" animals, they must meet specific requirements set down by international laws and regulations. In addition to these requirements, substances affecting animal, human or environmental health need to be detected. As such, certain chemical and physical composition traits of the ear tag will be evaluated.

This evaluation will involve 20 ear tags.

### 16.2.1 Characteristics of the ear tag plate plastic

To characterise the basic component of the plastic raw material, one ear tag plate is submitted to an Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy analysis. Sample preparation is not necessary as the ear tag plate is pressed directly against the ATR-crystal. After analysis, the resulting ATR spectrum will be compared with characteristic spectra stored in specific databases.

Following this analysis, a material sample is submitted to a Differential Scanning calorimetry (DSC) analysis to analyse the thermal characteristics of the material as per ISO 11357. This analysis allows the detection of overlapping IR curves, e.g. if an additional component of minor quality was used to stretch the main component. The test is performed in two heat-up phases:

- a. Phase 1: 30°C - 200°C to obtain information about post cross linking of the plastic material to detect processing effects
- b. Phase 2: 30°C - 400°C to analyse the thermal parameters.

### 16.2.2 Harmful substances

Pigmented plastics may contain critical heavy metals which must be recorded. These metals are: Cadmium (Cd), lead (Pb), mercury (Hg) and chromium (Cr). If chromium is detected, an additional analysis of carcinogenic hexavalent chromium will be done. The following limit values must not be exceeded:

- a. Cadmium: 100 mg/kg
- b. Lead: 10 mg/kg
- c. Mercury: 1 mg/kg
- d. Chromium: 10 mg/kg (Chromate (Cr VI): < 1 mg/kg)

### 16.3 Pre-treatments

Various treatments are required to prepare tags for the testing of particular characteristics and are outlined in the following sections. These pre-treatments and ensuing performance assessments are summarized in Table 7.

*Table 7. Pre-treatments and ensuing performance assessments for conventional plastic tags.*

	New tags			UV/rain aged tags		Damp heat/cold aged tags
	Untreated	Acid bath	Alkaline bath	Untreated	Abraded	Untreated
Visual readability						
Typography	×			×	×	
Colour contrast	×			×		
Machine readability						
Barcode scanning	×	×	×	×	×	×
Barcode quality check	×					
Resistance of the locking system	×			×		×

#### 16.3.1 Acid bath treatment

Five ear tags are immersed for 3 weeks in a 50°C acid liquid (acetic acid, pH = 3) to ensure compliance with ISO 175 for thermoplastics and ISO 1817 for vulcanized elastomers.

This test will only be done on ear tags made of plastic materials other than polyurethane (PU).

#### 16.3.2 Alkaline bath treatment

Five ear tags are immersed for 3 weeks in a 50°C alkaline liquid (sodium hydroxide, pH = 12) to ensure compliance with ISO 175 for thermoplastics and ISO 1817 for vulcanized elastomers.

This test will only be done on ear tags made of plastic materials other than polyurethane (PU).

#### 16.3.3 Ageing by damp heat and cold

In accordance with ISO 4611, 40 ear tags are placed into alternating cycles of 12 hours damp heat (40°C ± 2° / 95% RH) and 12 hours cold (-25°C ± 2°) for a duration of 3 weeks in a climatic chamber.

#### 16.3.4 Resistance to artificial ageing

In accordance with EN ISO 4892-2, procedure A/cycle 1, 40 ear tags are tested against resistance to sunlight. The exposure chamber will be fitted with xenon-arc lamps according to EN ISO 4892-2 and operated continuously for 1,000 hours. These 1000 hours will consist of repeated cycles of 102 minutes of radiant exposure followed by 18 minutes of combined irradiation and rain simulation. The irradiance level of the xenon-arc lamps will be 60 W/m<sup>2</sup> (at 300-400 nm).

#### 16.3.5 Abrasive treatment

Five new, untreated ear tags and five artificially aged ear tags will be subjected to an abrasive treatment as per ISO 9352. These tags will receive 1500 cycles of abrasion in a 21°C ± 2° laboratory environment.

The abrasive treatment uses CS17 abrasive wheels and a load of 1000 g (or 9.8 N). The front plates of the tags are cut to a disc of about 100 mm in diameter and mounted on the test plate of the Taber Abrader.

#### 16.4 Performance Assessment

##### 16.4.1 Typography readability

Five new, untreated tags and five tags from the following two treatment groups will be selected for assessment:

- a. Group 1: Artificially aged tags not subjected to the abrasive treatment
- b. Group 2: Artificially aged tags subjected to the abrasive treatment

Five randomly chosen numbers as given in Annex B3 in Section 14 will be printed on five white pages of paper. The font size, print style and character spacing will replicate that used for the ear tags.

The test tags and the pages with the printed numbers will be placed on a vertical surface (viewing surface) at head height in an appropriately lit laboratory room. Five assessors will stand 15 metres from the viewing surface and then commence walking towards it. Each assessor will attempt to read the numbers on the different ear tags and pages and the distance at which each device (ear tag or page) can be read without error will be recorded on the evaluation sheet.

The mean reading distance for both the pages and the ear tags will be separately calculated for each assessor and for the average of the assessors.

The following requirements must be met:

- a. New, untreated tags: The mean distance at which the reference printing is read on the ear tags must be at least 80 % of the mean distance at which the pages are read.
- b. Artificially aged tags with and without the abrasive treatment: The mean distance at which the reference printing is read for the ear tags must be at least 65 % of the mean distance at which the pages are read.

##### 16.4.2 Evaluation of colour contrast change

The colour difference of the ear tag plates and of the laser printing is measured and compared between three new ear tags and three artificially aged ear tags by use of spectral photometric measuring equipment according to ISO 7724.

After artificial ageing, the change in colour must be less than delta E\* of 10 CIELAB units.

##### 16.4.3 Evaluation of machine readability (optional)

This evaluation will occur if the manufacturer requests the machine readability testing in the Application Form ([Annex B1](#)).

For ear tags with linear barcodes, the "Quiet Zone" or margin at each end of the barcode must be at least 5mm. The height of the barcode must be at least 8mm.

##### 16.4.3.1 Barcode scanning

The ear tags subjected to the Phase 3 treatments will be scanned with three different handheld barcode readers. The barcode readers used for this test will be published on the ICAR website.

The treated ear tags will be scanned in sequence and after the initial ear tag is successfully read, the second tag is scanned until successfully read. Each ear tag will be scanned a maximum of four times. This procedure is repeated for each tag in the treatment group and after the last tag is scanned, the scanning is recommenced (Run 2) with the first tag. A total of 60 scans per treatment and reader type will be conducted to obtain sufficient data to assess performance.

The number of scans required to successfully read each tag (e.g. one, two, three or four) in each run is recorded.

The scanning success rate of tags from each treatment group is expressed in a percentage value and based on the number of scans required for a successful read. The performance of the tag is assessed against the minimum performance standards shown in Table 8.

*Table 8. Minimum performance standards for bar-code scanning.*

<b>No. of scans required</b>	<b>Proportion of tags successfully read at each scan</b>
1	95 %
2	98 %
3	99.7 %

The scanning performance achieved for each treatment is included in the ICAR report sent to Service-ICAR at the conclusion of the laboratory tests.

#### 16.4.3.2 Barcode print quality assessment

Print quality assessment will be undertaken on ten new, untreated tags using the protocols described below.

Using an ISO 15426-1 barcode verifier the linear barcodes are assessed for print quality according to ISO 15416. Every ear tag will be scanned ten times to build average grades.

An ANSI scale of A (highly satisfactory) to F (unsatisfactory) will be used to grade the print quality for each characteristic. When determining the overall print quality, the final score for the code on a tag is the worst grade recorded for any of the assessed characteristics. Failure reasons will be given in the test report.

The following linear barcode print quality specifications must be met:

- a. Decode (the only grades used are A and F): A
- b. Decodability: minimum D meaning >25%
- c. Check Character (if available): OK
- d. Symbol Contrast (Rmax - Rmin): minimum D meaning >25%

In the print contrast component of the test for 2D barcodes, the QR code and DM symbols are assessed for print quality using a barcode verifier that complies with the AIM International standards, Section "M" under Matrix Code Print Quality Guideline.

A scale of A (highly satisfactory) to F (unsatisfactory) will be used to grade the print quality for each characteristic. When determining the overall print quality, the final score for the code on a tag is the worst grade recorded for any of the assessed characteristics.

The following 2D barcode print quality specifications must be met:

- a. Decode (the only grades used are A and F): A.

- b. Symbol contrast: minimum D, meaning >25%.
- c. Print growth X axis and Y axis: A/A, A/B or B/A.
- d. Axial non-uniformity: A.

The standard of symbols must be no more than one print quality grade below that for each parameter on an unused tag without treatment.

#### 16.5 Evaluation of the resistance of the locking system

30 new, untreated ear tags, 30 artificially aged ear tags and 30 ear tags submitted to the damp heat and cold treatment will be subjected to increasing forces to determine the force required to cause breakage or unfastening of the ear tag.

The test is performed at -25°C (± 2°), 21°C (± 2°C) and 55°C (± 2°C) combined with 50% RH (when the temperature is greater than 0°C) with 10 ear tags from the three treatment variations.

The forces will be applied at a rate of 500 mm/min immediately after the tags are removed from the climatic chamber. The force applied to cause breakage or unfastening of each ear tag will be recorded. Broken or unfastened tags must not be re-useable. At 21°C (± 2°C), no breakage or unfastening of an untreated ear tag should occur in:

- a. Tags designed to be used in cattle with the application of a force lower than 280 Newton
- b. Tags designed to be used in sheep and / or goats with the application of a force lower than 200 Newton

Additionally, the distortion occurring in the ear tag at the time of breakage or unfastening will be recorded during the tensile tests as an indicator for any changes in the mechanical properties of the plastic after exposure to the artificial ageing and the damp heat/cold treatments.

## 17 Annex C1. Application for Device Composition and Environmental Performance test for external RFID devices

The form for the application form for an ICAR test on composition and environmental performance of external RFID devices is available [here](#) on the ICAR website.

The completed form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org).

## 18 Annex C2. Application for Device Change Notification (DCN) for external RFID devices modified during the 5-year certification

The form for the Device Change Notification is available [here](#) on ICAR website.

The completed form has to be emailed in PDF format to the Service-ICAR Secretariat to the following account: [manufacturers@icar.org](mailto:manufacturers@icar.org).

## 19 Annex C3. Phase 2 Preliminary Assessment for External RFID Devices

### 19.1 RFID ear tags

To assess the conformance of the RFID ear tags with the information given in the application form and to also detect any major failure e.g. electronic non-readability, damage of the tag at application, possible unlocking without deformation, inappropriate animal welfare design etc., the ear tags will be submitted to a Preliminary Assessment.

#### 19.1.1 Ear tag design

RFID ear tags shall have smooth, rounded corners and no sharp edges or protrusions specifically on the shaft of the piercing pin. The following measurements will be taken:

- a. The weight of the complete locked ear tag.
- b. The dimensions of the front and rear plate (height, width and thickness).
- c. The pin (length and diameter).
- d. The entrance hole of the cap.

Values and observations potential impacting on animal welfare will be reported.

#### 19.1.2 Electronic readability check

Every submitted RFID ear tag will be read with an ICAR approved handheld reader to ensure the reference ID codes transmitted meet the requirements outlined in Section 5.4.6.

#### 19.1.3 Locking mechanism checks

The primary purpose of these tests is to verify that the male to female locking mechanism, once correctly applied using the supplied applicator, cannot be subsequently dismantled in such a way that would allow the tag to be re-used. A locked ear tag should be tamperproof so tampering with the locked tag will render the tag unusable.

#### 19.1.4 Application test

The application evaluation will be carried out using two groups of tags:

- a. RFID ear tags classified as flag tags (extended front plates):
  - Group 1: 80 tags with the front and rear tag components locked together but without being inserted through ears
  - Group 2: 40 tags applied and locked into ears obtained post slaughter
- b. RFID ear tags not classified as flag tags:
  - Group 1: 40 tags with the front and rear tag components locked together but without being inserted through ears
  - Group 2: 40 tags applied and locked into ears obtained post slaughter

The performance level required for the submitted ear tags shall be:

- a. Successful locking of the front and rear tag components of all ear tags.
- b. No breakage of any tag component at locking.
- c. No deformation of any tag component after locking.
- d. No unlocking without breakage or irreparable damage to the ear tag.

The test centre will also check the rotation of the tag components on the locked tags. The following characterisation will be used:

- a. Tag components rotate freely.
- b. Tag components rotate but not freely.
- c. Tag components do not rotate.

#### 19.1.5 Resistance of the locking system

##### 19.1.5.1 Flag Tags

The 80 RFID ear tags of Group 1 will be divided into four sub-groups of 20 tags. Those four sub-groups will be subjected to increasing forces to determine the force required to cause breakage or unfastening of the ear tag. The forces will be applied at a speed rate of 500 mm/min. The force applied to cause breakage or unfastening of each ear tag will be recorded. Broken or unfastened tags must not be re-useable.

- a. Group 1: axial test at ambient conditions 21°C ( $\pm 2^\circ$ ).
- b. Group 2: axial test at 55°C ( $\pm 2^\circ$ ); the forces will be applied immediately after the tags are removed from the heating or climatic chamber.
- c. Group 3: transverse test at ambient conditions 21°C ( $\pm 2^\circ$ ).
- d. Group 4: transverse test at 55 °C ( $\pm 2^\circ$ ).

#### **Requirements**

- a. Broken or unfastened tags must not be re-useable.
- b. At ambient conditions, axially tested tags designed to be used in cattle shall not break or unfasten with the application of a force lower than 280 Newton.
- c. At ambient conditions, axially tested tags designed to be used in sheep and / or goats shall not break or unfasten with the application of a force lower than 200 Newton.
- d. The number of tags unlocked without breakage or sustaining permanent damage during the transverse test is recorded, and broken or unfastened tags must not be re-usable.

##### 19.1.5.2 Ear tags not classified as flag tags

The 40 RFID ear tags of Group 1 will be divided into two sub-groups of 20 tags. Those two sub-groups will be subjected to increasing forces to determine the force required to cause breakage or unfastening of the ear tag. The forces will be applied at a speed rate of 500 mm/min. The force applied to cause breakage or unfastening of each ear tag will be recorded. Broken or unfastened tags must not be re-useable.

- a. Group 1: axial test at ambient conditions 21°C ( $\pm 2^\circ$ ).

- b. Group 2: axial test at 55°C ( $\pm 2^\circ$ ); the forces will be applied immediately after the tags are removed from the heating or climatic chamber.

### Requirements

- a. Broken or unfastened tags must not be re-useable.
- b. At ambient conditions, axially tested tags designed to be used in cattle shall not break or unfasten with the application of a force lower than 280 Newton.
- c. At ambient conditions, axially tested tags designed to be used in sheep and / or goats shall not break or unfasten with the application of a force lower than 200 Newton.

#### 19.2 RFID leg tags

To assess conformance of the RFID leg tags with the information given in the application form and to also detect any major failure e.g. electronic non-readability, damage of the device at application, inappropriate animal welfare design etc., the leg tags will be submitted to a Preliminary Assessment.

##### 19.2.1 Leg tag design

RFID leg tags shall have smooth, rounded corners and no sharp edges or protrusions. The following measurements will be taken:

- a. The weight of the leg tag
- b. The dimensions of the leg tag (length, width and thickness)
- c. The adjustable diameter

Values and observations potentially impacting on animal welfare will be reported.

##### 19.2.2 Electronic readability check

Every submitted RFID leg tag will be read with an ICAR approved handheld reader to ensure the reference ID codes transmitted meet the requirements outlined in section 5.4.7.

## 20 Annex C4. Phase 3 Laboratory Test for External RFID Device.

### 20.1 Assessment of descriptive parameters

The parameters describing the RFID device will be assessed and compared to the information provided in the Application Form and, if applicable, the Preliminary Assessment report to ensure accuracy of description.

#### 20.1.1 Weight and dimensions

The following measurements will be taken from five of the submitted RFID devices:

- a. RFID ear tags: the measurements as listed in Section 19.1.1.
- b. RFID leg tags: the measurements as listed in Section 19.2.1.

### 20.2 Composition

Because external RFID devices are attached to "food producing" animals, they must meet specific requirements set down by international laws and regulations. In addition to these requirements, substances affecting animal, human or environmental health need to be detected.

This evaluation will involve 20 RFID devices.

#### 20.2.1 Characteristics of the plastic of the ear or leg tag

To characterise the basic component of the plastic raw material, one device is submitted to an Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy analysis. If the RFID ear tag contains a flag (an extended plate), the ear tag plate is pressed directly against the ATR-crystal. With leg tags or ear tags without a flag, the laboratory will determine if sample preparation is necessary. After analysis, the resulting ATR spectrum will be compared with characteristic spectra stored in specific databases.

Following this analysis, a material sample is submitted to a Differential Scanning calorimetry (DSC) analysis to analyse the thermal characteristics of the material as per according to ISO 11357. This analysis allows the detection of overlapping IR curves, e.g. if an additional component of minor quality was used to stretch the main component. The test is performed in two heat-up phases:

- a. Phase 1: 30°C - 200°C to obtain information about post cross linking of the plastic material to detect processing effects
- b. Phase 2: 30°C - 400°C to analyse the thermal parameters.

Melting point and glass transition temperatures are recorded to indicate the specific thermal characteristics of the plastic material.

#### 20.2.2 Harmful substances

Pigmented plastics may contain critical heavy metals which must be recorded. These metals are: Cadmium (Cd), lead (Pb), mercury (Hg) and chromium (Cr). If chromium is detected, an additional analysis of carcinogenic hexavalent chromium will be done. The following limit values must not be exceeded:

- a. Cadmium: 100 mg/kg
- b. Lead: 10 mg/kg
- c. Mercury: 1 mg/kg
- d. Chromium: 10 mg/kg (Chromate (Cr VI): < 1 mg/kg)

#### 20.3 Performance assessment

The tests described in this section are designed to determine the stability and endurance of the RFID devices.

The performance assessments are summarized in Table 9:

Table 9. Performance assessment of external RFID device.

	Electronic ear tags			Electronic leg tags. New
	New	Artificially aged	Damp heat treated	
Artificial ageing (ISO 4892-2, A/1)	×			×
Free fall (IEC 60068-2-32)	×	×		×
Cold (IEC 60068-2-1)	×			×
Dry heat (IEC 60068-2-2)	×			×
Damp heat (ISO 4611)	×			×
Tensile test of the locking system	×	×	×	
Visual readability				
Typography (flag tags only)	×	×		
Colour contrast change	×	×		
Electronic readability (ISO 24631-1, ISO 24631-3)*	×	×	×	×

A readability test is performed after every environmental test

#### 20.3.1 Initial readability test

Every RFID device will be read before starting any environmental test. The readability test is done according to ISO 24631-1 and 24631-3. Identification number (ID code), resonance frequency, minimum activation field strength and all relevant performance parameters are measured and recorded. The recorded values will be used as the reference for every following read test.

#### 20.3.2 Resistance to artificial ageing

In accordance with EN ISO 4892-2, procedure A/cycle 1, 40 ear tags are tested against resistance to sunlight. The exposure chamber will be fitted with xenon-arc lamps according to EN ISO 4892-2 and operated continuously for 1,000 hours. These 1000 hours will consist of repeated cycles of 102 minutes of radiant exposure followed by 18 minutes of combined irradiation and rain simulation. The irradiance level of the xenon-arc lamps will be 60 W/m<sup>2</sup> (at 300-400 nm).

Upon completion of the artificial aging treatment, a readability test is performed according to ISO 24631-1 and ISO 24631-3 on 20 randomly chosen devices to ensure every tag, as a whole, has survived the procedure with the transponder in situ and remains compliant with ISO 11784 and ISO 11785. The measured values are compared to those of the initial test.

#### 20.3.3 Resistance to tensile loading

This test applies to RFID ear tags only.

This test is done using 30 new ear tags, 30 artificially aged tags and 30 tags submitted to damp heat treatment. The test is performed at -25°C (± 2°), 21°C (± 2°) and 55°C (± 2°) combined with 50% RH (when the temperature is greater than 0°C) with every 10 ear tags from the three treatment variations.

To test the tensile strength of the locking mechanism the ear tag is affixed to a test jig simulating its application and attempts are made to remove the ear tag by subjecting it to increasing forces. The class 1 tensile test machine shall operate at a speed rate of 500 mm/min and be capable of generating loads of up to 1,000 N.

An increasing load will be applied in axial direction. The maximum load and the effect(s) of the tensile force on the appearance and/or efficacy of the ear tags will be recorded. Broken or unfastened tags must not be re-useable.

### Requirements

- a. At ambient conditions ( $21^{\circ}\text{C} \pm 2^{\circ}$ ), ear tags designed to be used in cattle shall not break or unfasten with application of a force lower than 280 Newton.
- b. At ambient conditions ( $21^{\circ}\text{C} \pm 2^{\circ}$ ), ear tags designed to be used in sheep and / or goats shall not break or unfasten with the application of a force lower than 200 Newton.
- c. The minimum breaking force applies to devices irrespective of treatments (artificial aging, damp heat, etc.)

#### 20.3.4 Resistance to impact of free fall

When tested in accordance with IEC 60068-2-32 the RFID device shall not split or crack after falling 1000 mm onto a concrete surface The test conditions are as follows:

- a. The tag component containing the transponder is levelled in 3 attitudes (horizontally, vertically top and bottom) and dropped twice in each attitude.
- b. The above test is carried out on three new and three artificially aged devices.
- c. The test shall be carried out at a temperature of  $21^{\circ}\text{C} (\pm 3^{\circ})$  and at ambient humidity. The test is repeated again after an hour's storage at  $-20^{\circ}\text{C} (\pm 2^{\circ})$  immediately after removing off the climatic chamber.

After the free fall test, a readability test is performed according to ISO 24631-1 and ISO 24631-3 on the tested RFID devices to ensure every device has survived the procedure with the transponder in situ and remains compliant with ISO 11784 and ISO 11785. The measured values are compared to those of the initial test.

#### 20.3.5 Resistance to cold

In accordance with IEC 60068-2-1, 10 new tags are exposed to a constant climate of  $-25^{\circ}\text{C} (\pm 2^{\circ})$  for 24 hours.

Directly after removing the samples from the climatic chamber a readability test is performed according to ISO 24631-1 and ISO 24631-3 on the tested RFID devices to ensure every device has survived the procedure with the transponder in situ with no change in performance. The measured values are compared to those of the initial test.

#### 20.3.6 Resistance to dry heat

In accordance with IEC 60068-2-2, 10 new tags are exposed to a constant climate of  $55^{\circ}\text{C} (\pm 3^{\circ})$  for 24 hours.

Directly after removing the samples from the climatic chamber a readability test is performed according to ISO 24631-1 and ISO 24631-3 on the tested RFID devices to ensure every device has survived the procedure with the transponder in situ with no change in performance. The measured values are compared to those of the initial test.

### 20.3.7 Resistance to damp heat and cold

In accordance with ISO 4611, 40 ear tags are placed into alternating cycles of 12 hours damp heat ( $40^{\circ}\text{C} \pm 2^{\circ}$  / 95% RH) and 12 hours cold ( $-25^{\circ}\text{C} \pm 2^{\circ}$ ) for a duration of 3 weeks in a climatic chamber.

Upon completion of this test, a readability test is performed on 10 ear tags according to ISO 24631-1 and ISO 24631-3 on the tested RFID devices to ensure every device has survived the procedure with the transponder in situ with no change in performance. The measured values are compared to those of the initial test.

### 20.3.8 Typography readability

This test applies to RFID ear tags classified as flag tags only.

Five new ear tags and five artificially aged tags will be selected for assessment.

Five randomly chosen numbers will be printed on five white pages of paper. The font size, print style and character spacing will replicate that used for the ear tags.

The test tags and the pages with the printed numbers will be placed on a vertical surface (viewing surface) at head height in an appropriately lit laboratory room. Five assessors will stand 15 metres from the viewing surface and then commence walking towards it. Each assessor will attempt to read the numbers on the different ear tags and pages and the distance at which each device (ear tag or page) can be read without error will be recorded on the evaluation sheet.

The mean reading distance for both the pages and the ear tags will be separately calculated for each assessor and for the average of the assessors.

The following requirements must be met:

- a. **New, untreated tags:** The mean distance at which the reference printing is read on the ear tags must be at least 80% of the mean distance at which the pages are read.
- b. **Artificially aged tags:** The mean distance at which the reference printing is read for the ear tags must be at least 65% of the mean distance at which the pages are read.

### 20.3.9 Evaluation of colour contrast change

The colour difference of the ear tag plates and of the laser printing is measured and compared between three new ear tags and three artificially aged ear tags by use of spectral photometric measuring equipment according to ISO 7724.

After artificial ageing, the change in colour must be less than delta  $E^*$  of 10 CIELAB units.